

DIV. OF FISHER

COMMERCIAL FISHERIES *Review*

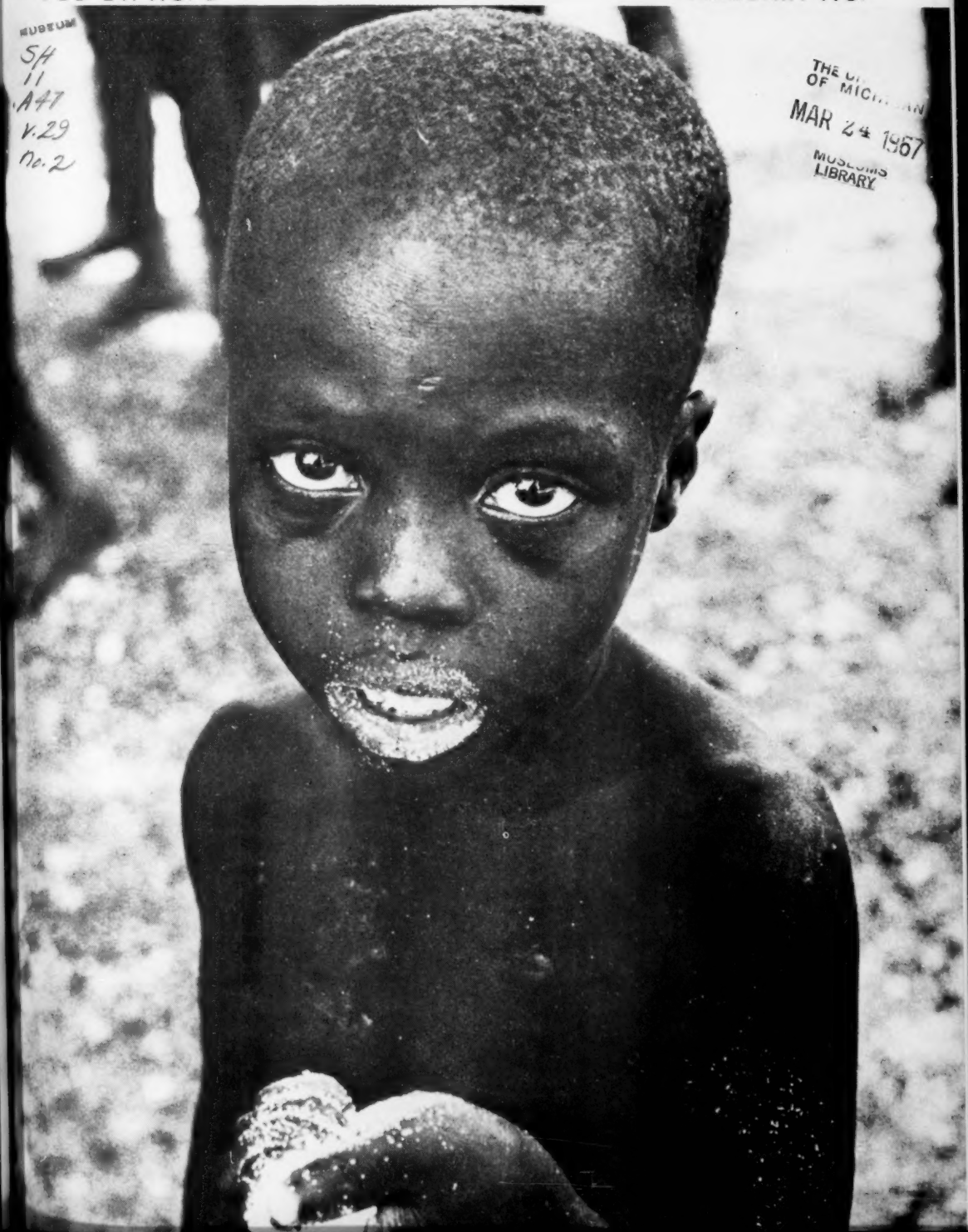
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COVER: This African boy was so hungry that he could not wait for the flour to be baked. The flour was provided by the UN's Food and Agriculture Organization.

For him--and for hundreds of millions of other children around the world who go to bed hungry every night--fish protein concentrate may ensure a better tomorrow.

(Photo: FAO)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



FISHERMEN'S MEMORIAL - GLOUCESTER, MASS.

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The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
for the Bureau of Commercial Fisheries.

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CONTENTS

	Page
UNITED STATES:	
Events and Trends	1
States	14
Bureau of Commercial Fisheries Programs .	15
INTERNATIONAL	29
FOREIGN:	
Canada	31
Latin America	33
Mid East	34
Europe	35
Asia	44
Africa	52
ARTICLES	55
INDEX	67



A Japanese fisherman and his family at evening meal. His favorite dish is "Sashimi," pieces of raw fish dipped in soy sauce. His forebears for hundred of years were fishermen. (WHO Photo: T. Takahara)

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INTERIOR WILL STEP UP FISH PROTEIN CONCENTRATE PROGRAM

The Department of the Interior will accelerate its fish protein concentrate (FPC) program. The order "go" will be given shortly after the end of a 30-day waiting period set by the Food and Drug Administration (FDA).

On February 2, 1967, FDA published in the "Federal Register" proposed regulations governing the sale of FPC as a food additive in interstate commerce. The 30-day period offers the public an opportunity to make valid objections.

FPC was made from whole Atlantic red hake, a codlike fish, by scientists of the Bureau of Commercial Fisheries. It looks like a light-tan flour and is virtually odorless and tasteless. It is over 80 percent animal protein and also has several nutritional minerals. The nutritive value of 2 ounces of FPC, costing about 3 cents, almost equals that of a 12-ounce steak costing nearly \$1. About 6 pounds of fish are needed to produce 1 pound of FPC.

Experts concerned with the world's population explosion and the desperate need to find new food sources believe FPC can become a lifeline to a better future for hungry millions everywhere.

About 2 billion of the 3 billion people on earth, including 50-70 percent of preschool children, suffer from protein malnutrition. This type of malnutrition can produce mental retardation in children; even ordinary childhood diseases may be fatal to them. And by the year 2000, the 3 billion people will be about 7 billion.

Secretary of the Interior Stewart L. Udall said that the FDA action means "that now for as little as a half-cent a day, an undernourished person, wherever he lives, can be assured of sufficient life-sustaining animal protein. World food and health organizations have pointed to protein hunger as the most desperate human problem of the century. We now have proved that fish protein concentrate, one very effective answer to protein malnutrition, can be produced in laboratory-size batches. Our next step is large-scale production demonstration in pilot plants."

The Department of the Interior is authorized to build one demonstration plant and to lease

another. A November 1966 law (PL 89-701) authorizes appropriations of \$1 million to build one plant--and \$1,555,000 annually for 5 years beginning July 1, 1967, to lease another plant, operate both the constructed and leased plants, and to conduct necessary research.

BCF scientists worked 3 years to develop the present process for making FPC. One breakthrough was the discovery that isopropyl alcohol would satisfactorily extract oil and water from the fish. This was an indispensable step toward making a stable and palatable product from an inexpensive fish.

On December 1, 1965, the National Academy of Sciences advised Secretary Udall that "fish protein concentrate, from whole hake, as prepared by the Bureau's process, is safe, nutritious, wholesome, and fit for human consumption."

The scientists at BCF's model-scale plant in Beltsville, Md., near Washington, D. C., found that the solvent-extracted FPC blends well with other foods. It was tested successfully as an ingredient in beverages, soups, noodles, gravy, bread, and cookies; adding FPC increases their nutritive value appreciably.

The hake used to make FPC were obtained from commercial fishermen in New England, immediately packed in ice, and shipped in a refrigerated truck to Beltsville. Hake are plentiful in the Atlantic and Pacific. Other species of fish also can be used.

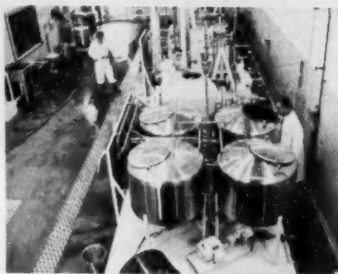
BCF specialists have estimated that the United States can easily harvest about 12 billion pounds of fish each year from U. S. waters--about $2\frac{1}{2}$ times the present catch. If only the fish that are not harvested now were made into FPC, they would provide the additional high-quality animal protein needed to balance the diet of 300 million people for a year at a cost of less than a half-cent per person per day.

When the ocean's underutilized resources are used to make FPC, the U. S. fishing, shipbuilding, and auxiliary industries also will gain.



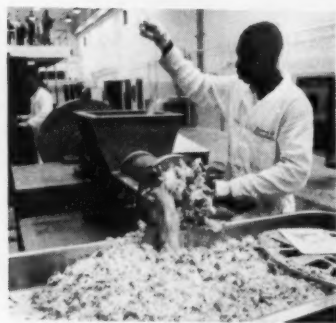


FPC is made here--in Beltsville, Md., near Washington, D. C. This is a pilot plant designed to evaluate equipment, processing methods, and to provide engineering samples.

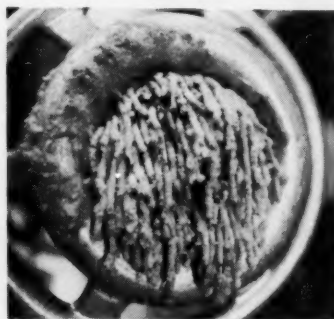


Overall view of lab from end of the processing line. L to R: Engineering Technician Al Novinski, Chemical Engineers Herb Brecker and Bob Ernst.

HOW FPC IS MADE



GRINDING FISH: Operator Tom Brown drops hake into grinder, which produces



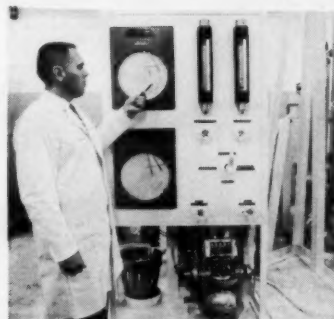
. a FISHBURGER



Fishburger is mixed with alcohol in unheated vessel to remove water and fat (they dissolve in alcohol).



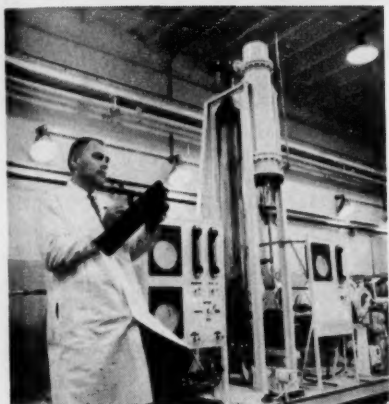
HOT ALCOHOL is used to continue the extraction of fats and moisture from the fish.



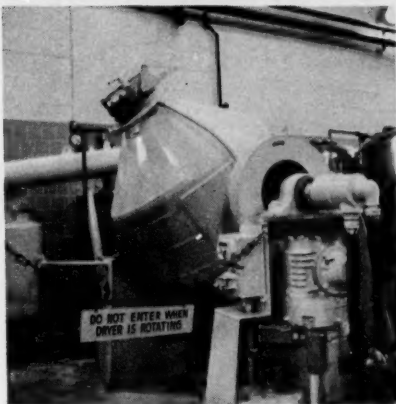
Processing of fish is conducted under carefully controlled conditions of time, temperature, and the completeness of each operation.



SEPARATION of solids, which drop into container, from liquids.



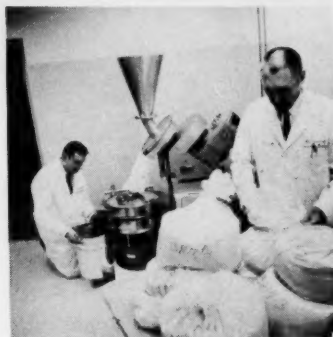
DISTILLATION COLUMN recovers alcohol, which is used again.



ROTATING VACUUM DRYER removes virtually all traces of the solvent (alcohol).



FPC



FINE GRINDER reduces fully dried FPC to particle size desired. It is bagged and marked to indicate the different experimental conditions under which it was produced.



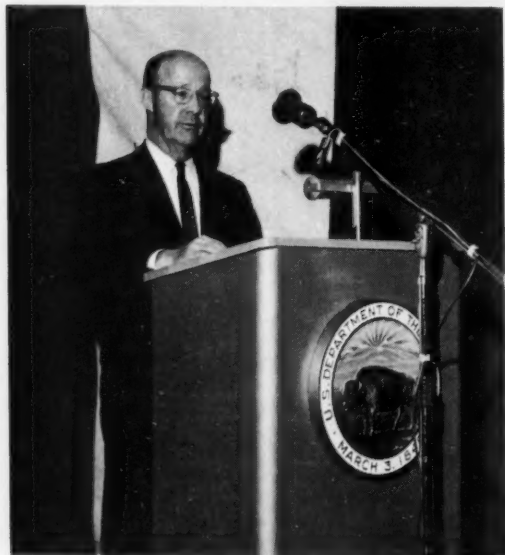
All these foods contain FPC.

BCF HEAD REPORTS STRIKING TECHNOLOGIC GAINS IN 1966

Crowther Also Tells Canners Convention
Interest in the Sea's Resources is Growing Rapidly

For several segments of the fishing industry, "1966 was a banner year," but overall the industry set few records, reported Harold E. Crowther, Acting Director, Bureau of Commercial Fisheries (BCF) to the National Canners Convention in Chicago on January 23.

But in two areas there were significant advances that portend even greater progress for the years ahead: technologic achievements by BCF scientists to aid the industry--and rapidly growing interest by Government and the public in the sea and its riches.



Harold E. Crowther.

Director Crowther said: "There is no doubt in my mind that events of last year clearly indicate that we are entering a new era of ocean science and the use of the ocean's resources."

These were the 1966 highlights presented by Director Crowther (the quotes are his):

Statistics on the Industry

- Per-capita consumption of edible products declined from 11 pounds in 1965 to 10.6.

However, per-capita supply of all products--edible and industrial--on a round-weight basis was 64 pounds, a recovery of the 9 pounds lost in 1965. The gain was attributed mainly to increased use of fish meal for poultry and livestock feed.

- Imports were up 100 million pounds over 1965, primarily fish meal and frozen blocks.

- Exports, only a small part of U.S. foreign trade, reached \$100 million, up slightly from 1965 and nearly double the value of \$48 million in 1960.

Legislation

- One of the most important developments was passage of the Marine Resources and Development Act of 1966, which provided for 2 high-level groups to carry out its purposes. "This Act is a significant milestone in establishing the importance of ocean resources and should help coordinate the efforts of 22 different agencies conducting oceanographic research. . . . We now have an instrument (the 2 groups) to define effectively a national ocean policy, to specify objectives and goals of a national oceanographic program, and to recommend how our country can best achieve these goals."

Effective Use of the Sea

- In July 1966, the survey vessel "Oceanographer" of the U. S. Coast and Geodetic Survey was commissioned.

- President Johnson released the report of his Science Advisory Committee, "Use of the Sea." The report is of special interest to those in industry, fishery research, and administration "because it places emphasis on development and use of natural resources of the oceans. This is especially meaningful for the Bureau's fish protein concentrate program."

To implement the PSAC report, Secretary Udall named a top-level Interior team headed by Assistant Secretary Stanley A. Cain to "develop and coordinate Interior's many programs for developing and utilizing resources of the sea."

• The concentration of scientific, technical, legal, and engineering talent at the Second Annual Marine Technology Conference in Washington last summer showed the widespread interest in developing ocean resources.

Financial and Other Aid Programs

• There was a substantial increase in BCF's 3 financial assistance programs--vessel construction subsidy, mortgage insurance, and fisheries loan fund. But by year's end, the programs were forced to mark time until new funds were made available. "Many in industry and Government believe these 3 programs are as important as any in the Bureau and are essential to development of a modern fishing industry."

• Federal Aid. 1966 was the first full year under the Commercial Fisheries Research and Development Act, Public Law 88-309. The appropriation acts in both fiscal 1966 and 1967 made \$4.1 million available to the States on a matching basis. The States responded well. "Many excellent research and development projects are now underway. PL 88-309 funds also are helping to upgrade many State fishery programs "through construction of laboratory facilities, research vessels, and employment of additional qualified personnel."

• Agency for International Development. BCF cooperated in AID's program of exporting low-cost fishery items to the Congo. In the past 8 months, AID made available \$1.1 million to buy canned fishery products.

Technologic Advances

BCF made progress in testing new harvesting and preservation methods:

• Two irradiators are being used on BCF vessels "Delaware" and "Oregon" in the Northwest Atlantic and Gulf of Mexico to test this method of pasteurization at sea. Haddock, shrimp, and clams have been irradiated and now are being tested in the laboratory for odor and taste qualities. This method might permit a vessel to remain at sea twice as long and still deliver high-quality fresh fish.

• BCF scientists at the Ketchikan (Alaska) Technology Laboratory developed a method that greatly facilitates shrimp peeling with present machines.

• In the Great Lakes, where alewife fishery development is emphasized, "a project aimed at developing an electric system to guide and harvest fish is well underway."

• During the past 2 years, BCF exploratory fishing and gear development scientists have developed an electro-shrimp trawling system that is as effective during daylight hours as standard gear is during darkness (when shrimp normally are available).

• In the Pacific Northwest, Seattle-based BCF scientists developed a system featuring a large midwater trawl that stimulated the appearance of a new U. S. fishery for Pacific hake.

• Sonar. Significant progress was made in developing "a long-range, high-definition sonar for locating schools of fish and as a research tool for inventory of fishery resources."

• Space Oceanography. BCF scientists are working with the Naval Oceanographic Office and NASA "to evaluate the use of spacecraft and satellites for gathering oceanographic data." In 1966, during the last Gemini flight, the BCF research vessel "Geronimo" carried out observations in the Gulf of Mexico.

• Artificial Rearing of Mackerel and Sardines. "One of the most important scientific breakthroughs was the first successful rearing in the laboratory of Pacific mackerel and Pacific sardines from the egg to an advanced juvenile stage."

• Sea Lamprey Control. "Excellent progress continues to be made in control of the predatory sea lamprey of the Great Lakes by using chemical lampricides." In 1966, BCF biologists reported the lamprey population down 91 percent from the previous 5-year average.

• Salmon. The 4-million-case Alaskan salmon pack was the largest since 1949 and the escapement was good. "Salmon appear to be responding well to improved management practices."

Office of International Trade Promotion

BCF organized this office in 1965 to promote and demonstrate quality U. S. fishery products abroad. The office participated in

two international food trade shows in 1965 and 6 in 1966. "A conservative estimate of total sales made during the 8 fairs is in excess of \$800,000."

Codex Alimentarius

The U. S. worked with 14 countries toward the development of international trading standards for fishery products through the Joint FAO/WHO Codex Alimentarius Commission.

End of Meatless Fridays

BCF is studying the effects of the end of meatless Fridays for Roman Catholics on the U. S. fishing industry.

The National Canners Convention also heard talks on legislation, the international situation, and Interior Department's responsibilities to the fishing industry from Senator Warren G. Magnuson (D., Wash.), Deputy Assistant Secretary for Fish and Wildlife and Parks, Clarence Pautzke, and Ambassador Donald L. McKernan.



Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



UNITED STATES

Forecast Fewer Groundfish and Scallop on New England Banks

Various species of groundfish and sea scallops fished by New England fishermen will generally be less abundant in 1967, forecasts BCF's North Atlantic Region. The forecast is based on information provided by biologists of BCF's Woods Hole Laboratory who monitor landings of commercial fishermen and use the research vessel "Albatross IV" to study, by sampling, the populations of fish and shellfish on offshore banks.

Haddock landings in New England in 1966 were about 118 million pounds, compared with 117 million pounds in 1965. The 1966 catch was high despite fewer fish on Georges Bank. The decrease was due to natural causes and heavy foreign fishing in 1965.



The Albatross IV, research vessel of BCF. (Photo: Robert K. Brigham.)

The haddock stock there now is in a serious condition since it consists mainly of a single year class of fish--the one spawned in 1963. Albatross IV surveys showed that the 1966 year class was a poor one, as were 1965 and 1964. About 60% of U. S. landings of Georges Bank haddock in 1966 were from the 1963 year class--in the scrod-size category.

In 1967, these will grow into the large-size haddock category. The abundance of scrod haddock will decrease in 1967 and following years. Total abundance of both size categories will decrease in 1967 and probably continue to decrease through 1968 and 1969.

The haddock picture is much brighter on Browns Bank. There, the large 1962 and 1963 year classes will just be coming into the fishery in 1967, so abundance is expected to increase somewhat in 1967 and substantially in 1968.

Cod Landings Steady, Whiting Up

Cod landings in 1966 were 29 million pounds, about the same as in 1965, although there was a slight decrease in abundance. The decrease is expected to continue through 1967.

Food fish landings of whiting (silver hake) from the Gulf of Maine increased from 74 million pounds in 1965 to an estimated 81 million in 1966, due to increased fishing effort. Abundance held steady and is not expected to change in 1967.

In southern New England, where whiting are taken primarily for industrial purposes, a decrease in abundance on the inshore grounds occurred in 1966--landings dropping from 1965's 23 million pounds to 7 million pounds. This stock was heavily fished by the Soviets in 1965 and 1966. It is expected that the United States fleet in this area will continue to have difficulty finding large commercial quantities in 1967.

Ocean perch (redfish) landings decreased from 83 million pounds in 1965 to 81 million pounds in 1966. Abundance increased in the Gulf of Maine and held steady on Nova Scotian and Gulf of St. Lawrence grounds. Abundance levels are expected to continue through 1967.

Yellowtail flounder abundance has been declining recently, due to low recruitment of year classes. This is reflected in the landings: they dropped from 75 million pounds in 1965 to 65 million pounds in 1966. The decline is expected to continue through 1967.

Red Hake Abundance Dropped Sharply

Red hake is taken by the southern New England fishery for industrial purposes and by the Soviets for food. Abundance dropped sharply in 1966, probably as a result of heavy

Soviet exploitation in 1965 and early 1966. U. S. landings in 1966 were only 10 million pounds, compared with 63 million pounds in 1965. If red hake are again heavily fished by the USSR, U. S. fishermen can expect continued low abundance on their traditional grounds.

Sea scallops again were landed from both Georges Bank and Middle Atlantic grounds in 1966. Landings from Georges Bank were about 2 million pounds of meats in 1966, compared with 3 million pounds in 1965, and abundance is expected to remain about the same in 1967.

The Middle Atlantic grounds provided about 11 million pounds in 1966, about the same as in 1965. Analysis of catches shows no backlog of older scallops, so abundance in 1967 will depend largely upon the size of the newly recruited year class.



Marketing

OUTLOOK FOR EDIBLE FISHERY PRODUCTS IN 1967 AND REVIEW OF 1966

As 1967 began, supplies of edible fishery products were heavier than a year earlier. Frozen stocks of ocean perch and cod fillets, dressed whiting, fish sticks and portions, halibut, and lobster tails were relatively abundant.

In the category of canned products, salmon was plentiful. Scallops and crabs (including crab meat) were among the few popular frozen items with lower stocks than at the beginning of 1966. All in all, supplies should be ample to meet the usual upsurge in demand during the coming Lenten season.



The per-capita consumption of fishery products dipped to 10.6 pounds (edible weight) in 1966, down 0.4 pound from the 11 of 1965, but about the same as in 1962-1964. Consumption of fresh and frozen fishery products gained in 1966--at an estimated 6.2 pounds per person, it was the highest since the early 1950s. All of the decline was in

canned fishery products, which dropped from 4.4 pounds in 1965 to 3.9 pounds in 1966. Consumption of cured products held at 0.5 pound per person.

There was no single factor responsible for the decline in per-capita consumption during 1966. The higher prices accompanying lower availability of canned tuna and pink salmon early in 1966 probably contributed to the decline. The effect of the change in fasting requirements of the Roman Catholic Church is under study. (Branch of Current Economic Analysis, BCF.)



December 1966 Wholesale Prices and Indexes for Edibles

Wholesale prices for edible fishery products (fresh, frozen, and canned) were up slightly in December 1966. At 125.3 percent of the 1957-59 average, the index rose 0.2 percent from November to December. This was principally because of higher prices for most items in the drawn, dressed, or whole finfish subgroup. Price increases for other items, including fresh shrimp and canned tuna, were offset by lower prices for several other products. Compared with December 1965, the overall index in December 1966 was up 5 percent because of higher prices generally for most items.

Seasonally higher prices in December 1966 for most items in the drawn, dressed, or whole



Wholesale Average Prices and Indexes for Edible Fish and Shellfish, December 1966 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1967-69=100)			
			Dec. 1966	Nov. 1966	Dec. 1966	Nov. 1966	Oct. 1966	Dec. 1965
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					125.3	125.0	131.3	119.3
Fresh & Frozen Fishery Products					126.7	126.6	136.1	120.6
Drawn, Dressed, or Whole Fish					123.7	121.0	136.2	123.4
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.15	.15	117.1	115.2	164.0	119.8
Halibut, West., 20/80 lbs., drad., fresh or froz.	New York	lb.	.48	.48	149.0	142.0	139.0	141.0
Salmon, king, lge. & med., drad., fresh or froz.	New York	lb.	.88	.86	122.2	120.2	129.6	122.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.71	.63	106.2	93.3	91.8	93.3
Yellow pike L. Michigan & Huron, rnd., fresh	New York	lb.	.69	.65	112.9	106.4	108.9	116.2
Processed, Fresh (Fish and Shellfish)					126.7	127.6	138.1	123.5
Fillets, haddock, sm., skins on, 20-lb. tins	Boston	lb.	.40	.47	97.2	114.2	131.2	106.7
Shrimp, lge. (26-30) count, headless, fresh	New York	lb.	1.07	1.03	125.4	120.1	131.2	106.6
Oysters, shucked, standards	Norfolk	gal.	7.75	8.25	130.7	139.1	147.5	147.6
Processed, Frozen (Fish & Shellfish)					124.9	125.1	128.6	110.6
Fillets; Flounder, skidless, 1-lb. pkg.	Boston	lb.	.45	.44	114.0	110.2	109.0	101.4
Haddock, sm., skins on, 1-lb. pkg.	Boston	lb.	.39	.40	114.3	117.3	115.8	116.8
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.31	.30	108.7	103.5	110.5	112.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.11	1.11	131.0	131.0	137.5	107.9
Canned Fishery Products					123.4	122.9	123.3	117.5
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	27.00	27.50	119.9	119.9	122.0	119.8
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	13.08	12.95	116.1	115.0	115.0	108.8
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.50	8.50	144.1	144.1	135.6	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	11.25	11.25	144.3	144.3	144.3	131.5
1/ Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.								
Source: U. S. Department of Labor, Bureau of Labor Statistics.								

1/Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

finfish subgroup resulted in a 2.2-percent increase from November. Wholesale prices at Chicago rose sharply for Lake Superior fresh whitefish (up 12.8 percent) because of very light supplies. At New York City, prices were up 6.1 percent for Great Lakes round yellow pike, rose 1.7 percent for frozen king salmon, but they remained unchanged for frozen western halibut. Prices for exvessel large haddock at Boston (up 1.6 percent) were higher from November to December. Compared with December 1965, the subgroup index in December 1966 was up 0.2 percent--prices were higher for whitefish (up 12.8 percent) and halibut (up 0.7 percent) but were partly offset by slightly lower prices for other items.

Shellfish Are Mixed Picture

Although December 1966 prices for South Atlantic fresh shrimp at New York City rose 4.4 percent from November, they were offset by a sharp price drop at Boston for fresh haddock fillets (down 14.9 percent). Prices also dropped for standard shucked oysters (down 6 percent) at Norfolk. These lower

prices brought the processed fresh fish and shellfish subgroup index down 1.5 percent from November. Compared with December 1965, the subgroup index in December 1966 was up 1.8 percent, mainly because shrimp prices were higher (up 17.6 percent) and cancelled out lower prices for shucked oysters (down 11.4 percent) and haddock fillets (down 8 percent).

The December 1966 subgroup index for processed frozen fish and shellfish was down 0.2 percent from November. Although prices at Boston for frozen ocean perch fillets rose 5 percent and flounder fillets 3.4 percent, prices for small haddock fillets were down 2.6 percent. Frozen shrimp prices at Chicago remained unchanged from November. Compared with December 1965, the December 1966 subgroup index was 12.9 percent higher because of substantially higher shrimp prices (up 21.4 percent). Prices for flounder fillets (up 12.4 percent) were higher than a year earlier, but they were lower for ocean perch (down 3.1 percent) and haddock fillets (down 1.3 percent).

Higher prices from November to December for canned tuna (up 1 percent) were solely responsible for a 0.4 percent rise in the subgroup index for canned fishery products. Prices were unchanged for other canned fish items. Compared with December 1965, the subgroup index for December 1966 was up 5 percent. Prices were higher for all items--more substantially so for California jack mackerel (up 19.2 percent) and canned Maine sardines (up 9.7 percent). (BCF Market News Service.)



1966 Shrimp Imports Rose 8.7%

U. S. imports of shrimp (fresh, frozen, canned, and dried) for January-November 1966 were 160.8 million pounds--an increase of 8.7 percent from the 1965 period's 147.9 million. Imports from Mexico for the 1966 period were about 60.8 million pounds--up 12.9 percent from 1965's 53.8 million pounds.

The U. S. imported 20.4 million pounds of shrimp (fresh, frozen, canned, and dried) in November 1966; in November 1965, 18.5 million pounds. Imports during November 1966 of fresh or frozen heads-off shrimp (shells-on) were 15.9 million pounds; peeled and deveined, 3 million pounds; frozen breaded (raw or cooked), 82,572 pounds; and other types¹ of shrimp products (some dried and canned) about 1.3 million pounds.

Mexico shipped about 10.5 million pounds; about 8.9 million pounds of fresh or frozen heads-off shrimp (shells-on); peeled and deveined, 1.3 million pounds; frozen breaded (raw or cooked) 82,084 pounds; other types, 169,596 pounds. In November 1965, Mexico shipped 9.6 million pounds.

¹/Imports of "other types" of shrimp: peeled in airtight containers or canned (233,456 pounds); cooked but not breaded (173,870 pounds); dried (58,801 pounds); others not specified (838,513 pounds).



Salmon

DECEMBER 1966 PACIFIC CANNED STOCKS HIGHER THAN 1965

On December 1, 1966, canners' stocks (sold and unsold) in the U. S. of Pacific canned salmon totaled 3,294,606 standard cases

(48 1-lb. cans)--816,548 cases above the 2,478,058 of December 1, 1965.

Of total stocks of 4,340,853 actual cases (cans of $\frac{1}{4}$ -lb., $\frac{1}{2}$ -lb., 1-lb., etc.)--red accounted for 2,117,218 cases (911,258 cases were 1-lb. cans and 798,015 cases were $\frac{1}{2}$ -lb. cans) or 48.8 percent of the total canners' stocks on December 1, 1966; pink--1,562,139 cases or 36 percent (1,180,122 cases were 1-lb. talls); chum--316,899 cases, mostly 1-lb. talls; coho or silver--227,441 cases; and king--117,156 cases.

Total Canners' Stocks of Pacific Canned Salmon, Dec. 1, 1966			
Species	Dec. 1, 1966	Nov. 1, 1966	Dec. 1, 1965
. (No. of Actual Cases)			
King . . .	117,156	119,188	123,126
Red . . .	2,117,218	2,246,350	1,902,932
Coho . . .	227,441	258,476	193,729
Pink . . .	1,562,139	1,655,427	767,120
Chum . .	316,899	368,069	305,471
Total	4,340,853	4,649,510	3,292,378

5 Million Cases for 1966/67 Market

Carryover stocks at the canners' level totaled 743,166 standard cases on July 1, 1966, the approximate opening of the Pacific salmon packing season. Adding the 1966 new season pack of 4,344,732 standard cases (preliminary data) the total available supply for the 1966/67 market season was 5,087,898 standard cases.



Shipments at canners' level of all salmon species, July 1 to December 1, 1966, totaled 1,793,292 standard cases. The carryover of 743,166 standard cases on July 1, 1966, the beginning of the 1966/67 sales year, was 1.3 percent higher than the carryover of 733,575 cases a year earlier.

Final data on the 1966 U. S. pack of Pacific canned salmon (including Alaska) show 4,344,732 standard cases--22.7 percent above 1965's of 3,541,187 cases. By species, the new pack was made up (1965 pack in parentheses): king, 81,626 standard cases (95,503); red, 1,441,930 cases (2,013,077); coho, 196,017 cases (170,064); pink, 2,044,479 cases (951,688); chum, 580,680 cases (310,855).

Data on canned salmon stocks are based on reports from U. S. Pacific Coast canners who handled over 96 percent of the 1966 salmon pack. (Division of Statistics and Economics, National Canners Association, Jan. 5, 1967.)



Defense Bought More Fishery Products in October-November 1966

The Department of Defense (DOD), a major buyer of fresh and frozen fishery products, bought 2.9 million pounds in November 1966, worth about \$2.3 million.

In November 1966, DOD purchases rose 10.3 percent in quantity and 3 percent in value. The increase was due mainly to larger purchases of oysters, fish fillets, haddock portions, and salmon steaks.

Compared with November 1965, November 1966 purchases were up 13.4 percent in quantity and 16.2 percent in value. Average prices were generally higher in November 1966 than in 1965.



Cans Shipments for Fishery Products Steady



During January-October 1966, 2,580,702 base boxes of steel and aluminum were used to make cans shipped to fish and shellfish canning plants. During the same period in 1965, 2,539,115 base boxes were used.

Note: Statistics Cover all commercial and captive plants known to be producing metal cans. A "base box" is an area of 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by use of the factor 23.7 base boxes per short ton of steel.

Source: U. S. Department of Commerce, Bureau of the Census.



Fish Meal Supply Rose 20%, Solubles Dropped 13%

Based on domestic production and imports, the supply of fish meal available in the U. S. during the first 11 months of 1966 was 603,034 short tons--99,628 tons (or 19.8 percent) more than the 1965 period. Domestic production was 46,555 tons (20 percent) lower, but imports were 157,334 tons (60.6 percent) higher than in January-November 1965. Peru lead with shipments of 259,051 tons.

U. S. Supply of Fish Meal and Solubles, January-November 1966			
Item	Jan.-Nov.		Total 1965
	1966	1965	
. . . (Short Tons) . . .			
Fish Meal and Scrap:			
Domestic production:			
Groundfish	9,877	10,179	10,696
Herring	10,984	12,688	12,932
Menhaden 1/	128,842	169,871	175,959
Tuna and mackerel	28,259	23,124	25,399
Unclassified	8,047	16,702	17,360
Total production 2/	186,009	232,564	242,346
Imports:			
Canada	41,132	40,046	43,830
Peru	259,051	206,006	209,801
Chile	80,623	5,201	5,651
Norway	21,048	78	78
So. Africa Rep.	6,600	3,600	5,100
Other countries	8,571	4,760	6,206
Total imports	417,025	259,691	270,666
Available fish meal supply	603,034	503,406	524,717
Fish Solubles 3/:			
Domestic production	80,738	92,290	94,839
Imports:			
Canada	1,352	1,373	1,488
Peru	1,941	2,598	2,598
Mexico	385	227	227
Other countries	470	825	825
Total imports	4,148	5,023	5,138
Available fish solubles supply . .	84,886	97,313	99,977
1/ Includes other species.			
2/ Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.			
3/ Wet weight basis except for imports from South Africa Republic (included in "other countries").			
Source: U. S. Department of the Interior, BCF, and U. S. Department of Commerce, Bureau of the Census.			

The U. S. supply of fish solubles was 84,886 tons--down 12.8 percent from the 1965 period. Domestic production decreased 12.5 percent, imports decreased 17.4 percent.



Over 100 Fishery Cooperatives

There are more than 100 fishery cooperatives in the United States with 10,124 members. The members owned and operated 7,514 commercial fishing boats or vessels. Over 60 percent of the cooperatives are on the Pacific Coast, and the rest are scattered. Most cooperatives do the marketing and buying for their members.



Oceanography

GULF COAST SALT DOMES MAY HAVE OTHER USES

Information on the 329 proved salt domes in the Gulf of Mexico area appears in the free Bureau of Mines publication, "Salt Domes in Texas, Louisiana, Mississippi, Alabama, and Offshore Tidelands: a Survey," Information Circular 8313. The Gulf area contains nearly all of these geological phenomena in the U. S., except for small sections of southern Utah and Colorado. The domes are important sources of rock salt, and many domes have petroleum and sulfur deposits combined with them.

Salt domes can be shaped to whatever size is desired--by dissolving salt from the formation--for inexpensive storage of natural gas. The cost of doing this is estimated at about one percent of installing steel tanks above ground.

Of the 329, four are in the Gulf off Texas and 67 off Louisiana. From 1937-1964, Louisiana domes produced 379,481,700 barrels of petroleum and condensate; one at Grand Isle also produced 1,973,000 tons of sulfur.

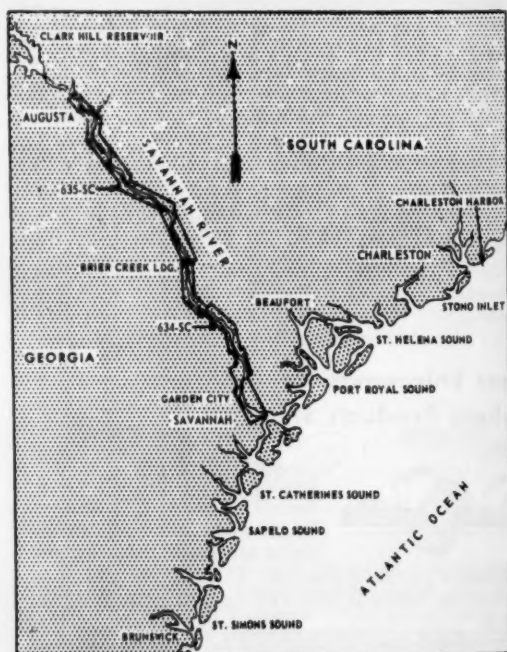
PLAN FOR PLANNED ATLANTIC SHELF SEDIMENT DATA BANK

National interest in developing the U. S. Continental Shelf for resources has prompted the Naval Oceanographic Data Center to set up an Atlantic Shelf sediment data bank. About 250 groups representing Government academic institutions and industry were asked about their holdings of data or sediment samples and their willingness to con-

tribute data to the project. Forty percent answered.

FIRST NAUTICAL CHARTS FOR SAVANNAH RIVER CHANNEL AVAILABLE

The Coast and Geodetic Survey has prepared the first nautical charts for the 180-mile-long, 9-foot Savannah River channel from Savannah to Augusta, Ga. The charts, identified as 634-SC and 635-SC, are folded small-craft charts, similar to those for the Atlantic Coast Intracoastal Waterway. They were designed for the small cockpits of pleasure craft and provide special information for them.



Savannah River, Georgia area (Savannah to Augusta) covered by new small-craft charts.

The charts are based on 1964 aerial photography by the Coast and Geodetic Survey and show the latest channel information available from the Army Corps of Engineers. Augusta is one of Georgia's 5 major ports and the improved Savannah River is an important link in the State's waterway system.

New editions of Chart 634-SC will be published annually and of 635-SC every 2 years. They can be kept timely between editions by adding corrections published in local or week-

ly notices to mariners. They may be bought for \$1 each from nautical charts agents or from the Coast and Geodetic Survey, Washington Science Center, Rockville, Md. 20852.



SEAFOODS SAY -- POUNDS AWAY

From the quiet charm of Maryland's Eastern Shore and from the exotic Middle East come two unusual seafood dishes designed to delight the dieter.

Satisfying nourishment is the keynote in Chef's Salad Chesapeake with Lemon-Caper Dressing. Asparagus spears, nested in lettuce cups, are topped with crab meat, hard-cooked egg, and a perky, low calorie dressing to win the compliments of the weight watchers and the accolades of the hearty eaters.

CHEF'S SALAD CHESAPEAKE

- | | |
|--|---|
| 1 can (12 ounces) blue crab meat
or other crab meat, fresh,
frozen, or pasteurized
or | 1 package (10 ounces)
frozen asparagus spears
6 lettuce cups
Lemon-Caper Dressing
3 hard-cooked eggs, sliced
Paprika |
| 2 cans (6-1/2 or 7-1/2 ounces
each) crab meat | |

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Flake the crab meat. Cook asparagus spears according to directions on package. Drain and chill. Place 3 asparagus spears in each lettuce cup. Place about $\frac{1}{2}$ cup crab meat on asparagus. Cover with approximately 2 tablespoons Lemon-Caper Dressing. Top with 3 slices hard-cooked egg. Sprinkle with paprika. Serves 6. Approximately 130 calories in each serving.

LEMON-CAPER DRESSING

- | | |
|---|-----------------------------------|
| 1/2 cup low calorie salad dressing
(mayonnaise type) | 1/2 teaspoon Worcestershire sauce |
| 1 tablespoon drained capers | 2 drops liquid hot pepper sauce |
| 1 tablespoon lemon juice | |
| 1/2 teaspoon prepared mustard | |

Combine all ingredients. Chill. Makes approximately $\frac{2}{3}$ cup salad dressing.

Cod Curry is an easy exotic, as meaty cod fillets blend with a colorful combination of readily available kitchen staples. The subtle hint of curry excites taste buds in this high protein entree while vegetables and skim milk add only a few calories to the showy sauce.

COD CURRY

- | | |
|--|-------------------------|
| 2 pounds cod fillets or other fish
fillets, fresh or frozen | 1 teaspoon curry powder |
| 1 cup thinly sliced celery | 1 teaspoon salt |
| 1 cup thinly sliced onion | Dash pepper |
| 1 tablespoon melted fat or oil | 3/4 cup skim milk |
| | Paprika |

Meals with minimal calories, maximum flavor, and eye-appeal aren't the easiest thing in the world to come by. However, even company dinners that meet these requirements come easy if you consider all that fish and shellfish have to offer. To help you with your planning, the United States Department of the Interior's Bureau of Commercial Fisheries has released a new, 16 page, full-color, diet booklet, Seafood Slimmers, which is available by sending 25¢ to the Superintendent of Documents, Washington, D. C. 20240.



Chef's Salad Chesapeake and Cod Curry are meals with minimal calories, maximum flavor and eye appeal which are easy to prepare.

Thaw frozen fillets. Skin fillets and place in a single layer in a greased baking dish, 12 x 8 x 2 inches. Cook the celery and onion in fat for 5 minutes. Stir in seasonings and milk. Spread over fish. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until fish flakes easily when tested with a fork. Sprinkle with paprika. Serves 6. Approximately 140 calories in each serving.

STATES

Alaska

FISHERY PRODUCTS ARE MOST VALUABLE IN ITS 100TH YEAR

In the centennial year of its purchase from Russia for \$7.2 million, the value of Alaska's processed fishery products is over \$125 million a year, twice the next most valuable industry--forest products worth \$58 million.



Oregon

UMATILLA INDIANS SEEK TO ESTABLISH COHO SALMON RUN

A campaign to restore coho (silver) salmon in the Umatilla River of Northeastern Oregon has been launched by Oregon State and Federal agencies in cooperation with the Umatilla Confederated Indian Tribes. Coho runs flourished in this stream before the development of the region destroyed them.

A major step in the program was taken with the planting of 500,000 coho eggs on the Umatilla Indian Reservation about 12 miles east of Pendleton, Oregon. The eggs were planted in wooden incubation boxes designed by BCF and installed in special facilities constructed by the Indians in fall 1966.

Officials of the U. S. Fish and Wildlife Service hope that many of the half-million eggs will hatch into baby salmon in about a month; then, after living in the river for about a year, will make the long journey to the Pacific Ocean via the Columbia River. Those that survive the rigorous trip and the sea's perils will return to the Umatilla River 2 or 3 years later to spawn--reestablishing the coho runs.



North Carolina

CALICO SCALLOP FISHERY THRIVES

For the past few months, 7 to 10 vessels have been landing daily 500-600 bushels per vessel of calico scallops in Morehead City, N. C. The vessels normally operate 5 days per week and most of the catch is processed by 2 shucking plants. The weekly production is about 300,000 pounds (pints) of meats.

Several factors aided the development of this fishery: BCF's exploratory operations delineated the resource; its technical assistance familiarized local fishermen with scallop dragging techniques; State and local interests combined to promote use of this resource.



Washington

PUGET SOUND HAKE FISHERY SHOWS PROMISE

From the season's start in late October 1966 through mid-January 1967, 2 million pounds of hake were landed in the Saratoga Passage-Port Susan area of the Sound. Most of the fish were landed by one vessel using midwater trawls. Later, 3 more trawlers joined the fishery.

BCF's Seattle-based gear specialists have provided technical assistance to these vessels in the design and use of midwater trawls, and in installing depth telemetry systems. The fishery normally lasts until June and is expected to surpass last year's $6\frac{1}{4}$ million pounds.



Virginia

FOSSIL OYSTERS FOUND ON CONTINENTAL SHELF

A clump of large oyster shells was seined from the bottom in 90 feet of water, several miles off Chincoteague, by Captain Herbert Freeman of the "Elsie Jane" working out of Hampton, Virginia. According to Dr. J. D. Andrews, Virginia Institute of Marine Science, these are shells of Virginia oysters--but oysters do not grow in water deeper than 50 feet, nor offshore in the open ocean.

There are indications that about 10,000 years ago many lagoons and estuaries existed over the present continental shelf. Many fossil oyster shells have been collected from shelf waters along the Atlantic coast. Radio-carbon techniques indicate that these oysters were alive about 9-11,000 years ago.



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

It sought "ground truth" for
Gemini XII's photography

CRUISE "DELTA I" OF THE "GERONIMO"

By Reed S. Armstrong, John R. Grady, and Robert E. Stevenson*

On November 8, 1966, the R/V "Geronimo" sailed from Galveston, Tex., for the Mississippi River Delta to acquire oceanographic

information on the sparsely sampled Delta area and to obtain "ground truth" for the photography of the Gemini XII manned space-

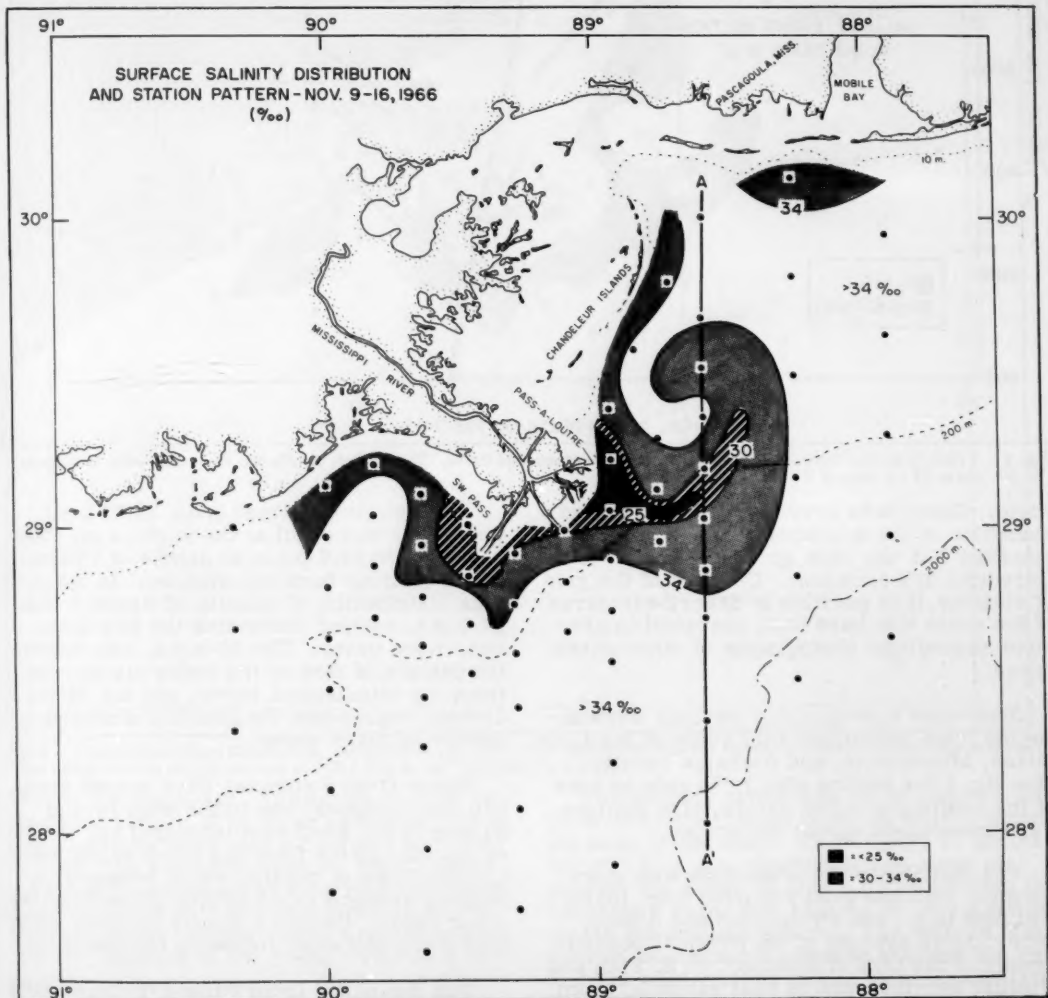


Fig. 1 - The surface salinity distribution around the Mississippi Delta, November 9-16, 1966. Note the eddy northeast of the Delta.

*Research Oceanographers, BCF Biological Laboratory, Galveston, Texas.

Note: Contribution No. 231, Bureau of Commercial Fisheries Biological Laboratory, Galveston, Tex.

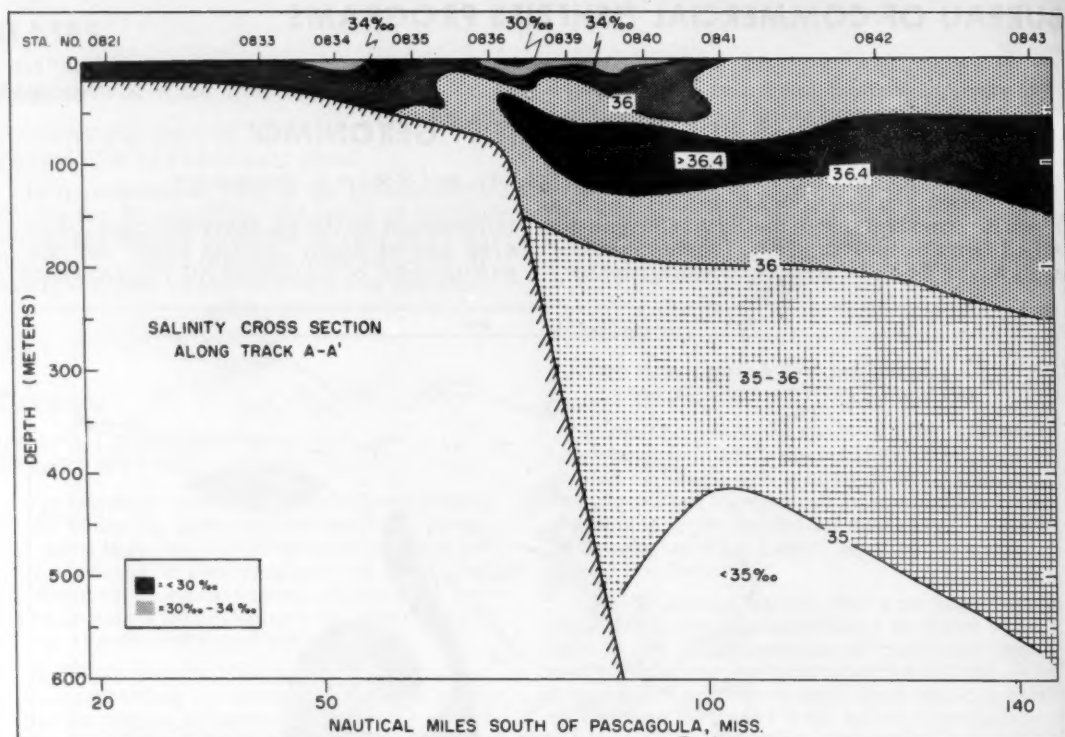


Fig. 2 - A salinity section through the eddy northeast of the Mississippi Delta. The vertical distribution around the eddy is apparent in the waters off the edge of the shelf.

flight. Cloudiness over the Delta prevented execution of the spacecraft's photographic mission, but the data gathered from the Geronimo are excellent. Because of the grid of stations, it is possible to describe features of the scale that have been observed in previous spaceflight photographs of other ocean areas.

Sixty-nine hydrographic stations were occupied from November 9-17 south of the Louisiana, Mississippi, and Alabama coasts. (See fig. 1 for station plan.) To gain an idea of the continuity in the waters, nine stations were reoccupied during the cruise.

The distribution of properties was more complex than has been reported from historical data (e.g., see Drummond and Austin, 1958, "Some aspects of the physical oceanography of the Gulf of Mexico," U. S. Fish and Wildlife Service), and is best exhibited from the salinity and oxygen content.

The salinities varied from 13.01 p.p.t. (parts per thousand) at the surface off Pass-a-Loutre to 36.7 p.p.t. at depths of 150 m. at the stations farthest offshore. In the surface distribution of salinity of figure 1, the 34-p.p.t. contour delineates the brackish, nearshore water. The 30-p.p.t. line defines the pattern of flow of the water discharged from the Mississippi River; and the 25-p.p.t. contour represents the greatest seaward extension of river water.

Water from Southwest Pass moves along two main tongues, one to the west (which curves to the southwest offshore) and the other parallel to the first but more to the south. Counterflows of oceanic water between the tongues produce rapid mixing of the brackish river water. Lesser volumes of river water flow north and east, following the coastline.

The discharge from Pass-a-Loutre splits into two flows, one to the north and the other

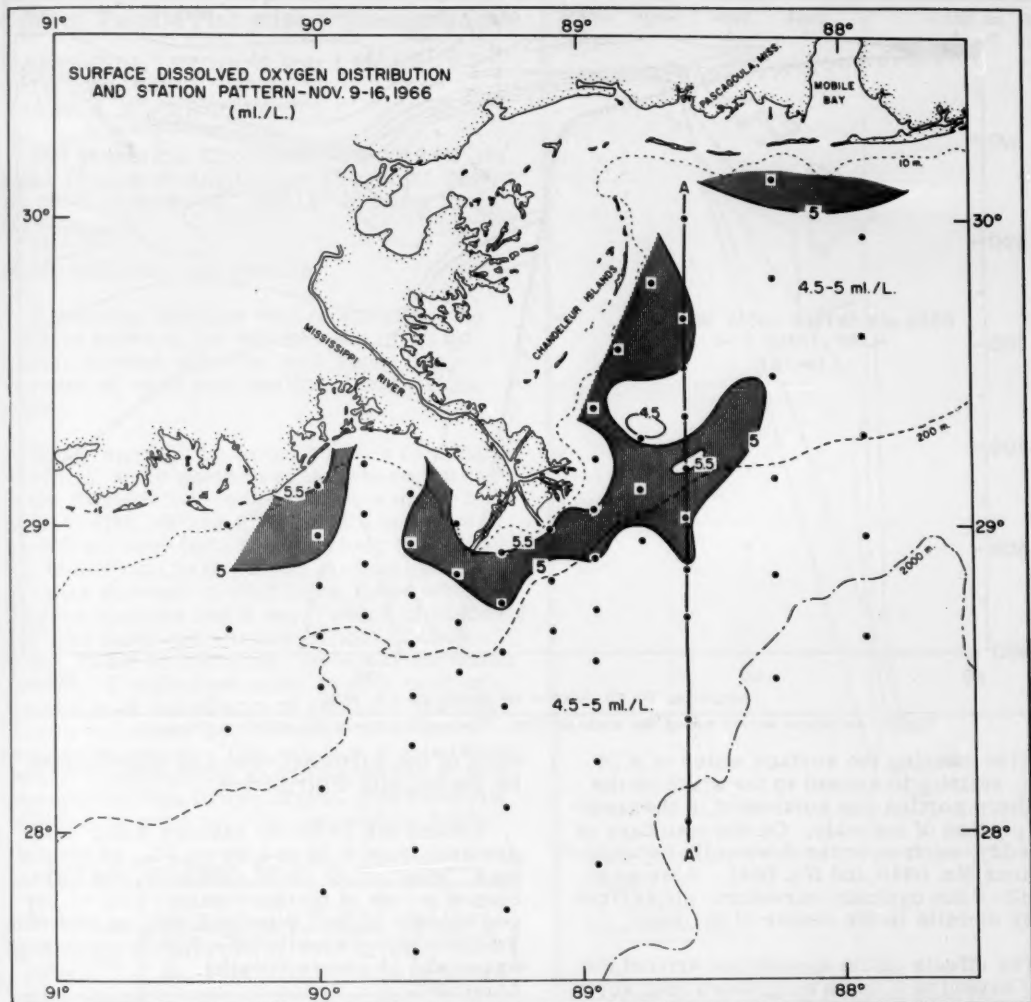


Fig. 3 - The surface oxygen distribution, November 9-16, 1966. The conformity with the salinity and the river discharge is clear. The waters with an oxygen content of 5-5.5 ml./L. are indicated by shading.

toward the southeast. The northerly flow remains nearshore. The river water that moves southeasterly feeds into a cyclonic eddy that is about 150 km. in diameter. This eddy is apparently maintained by a current that moves westerly off Mobile Bay and turns south off the Chandeleur Islands, and by a northeasterly current offshore of the Delta. The eddy is probably a semipermanent feature as these currents are at least semiprevailing circulations.

The salinity cross-section of figure 2 depicts additional features of the waters around the area of the eddy. As in figure 1, the water of < 30 p.p.t. represents the river discharge; the areas of < 34 p.p.t. represent the nearshore water and regions of > 34 p.p.t. indicate the oceanic waters. The eddy in this section is contained between stations No. 0833 and No. 0841 and the center is at about station No. 0835. Because of the cyclonic curvature, the surface water is drawn to the outside of

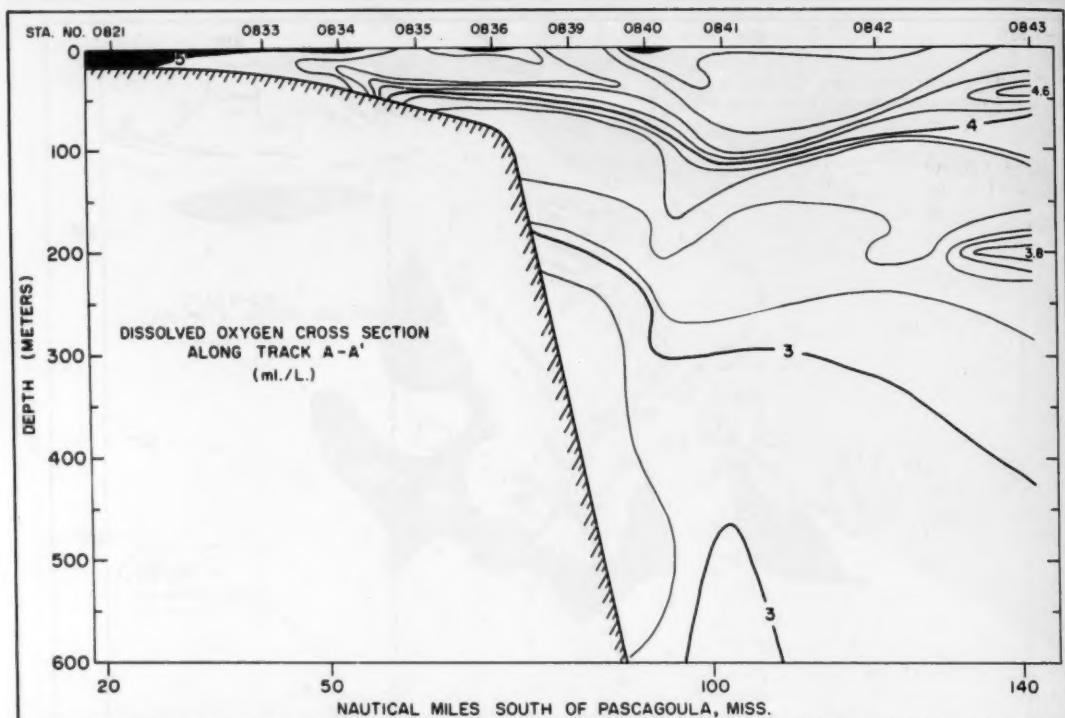


Fig. 4 - An oxygen section through the northeast eddy. The conformity with the salinity is clear.

the flow causing the surface water of <34 p.p.t. salinity to spread to the south in the southern portion and northward in the northern portion of the eddy. On the boundary of the eddy, surface water downwells between stations No. 0840 and No. 0841. Also as a result of the cyclonic curvature, subsurface water upwells in the center of the eddy.

The effects of the circulation around the eddy extend to a depth no greater than about 225 m. The deep upwelling represented by the rising 35-p.p.t. contour is probably associated with the offshore northeasterly current.

The distribution of dissolved oxygen (fig. 3) off the Delta distinctly reflects the pres-

ence of the northeast-trending eddy defined by the salinity distribution.

Around the Delta the inshore water has a gradient from 4.78 to 5.84 ml./L., at the surface. West of the Delta, however, the intrusion of a lobe of offshore water, with an oxygen content of less than 5 ml./L., is apparent. To the south of Mobile Bay, highly oxygenated water was at greater depths.

Offshore, the surface pattern of the oxygen distribution is broken by upwelling of water of lower oxygen content associated with the eddy (fig. 4). The area east of the Delta where the surface oxygen values are >5.00 ml./L. appears to coincide with the axis of the eddy.



Central Pacific Fisheries Investigations

"CROMWELL" STUDIES RELATION BETWEEN BIRDS, SURFACE SCHOOLS, SONAR TARGETS

The Townsend Cromwell continued its sonar studies during Cruise 28 (Oct. 21-Nov. 16, 1966) between 12° and 18° N. along long. 155° W.

Major Missions and Results

A primary mission was to examine the relation between the occurrence of bird flocks, surface schools, and sonar targets in areas of deep and shallow thermocline depths.

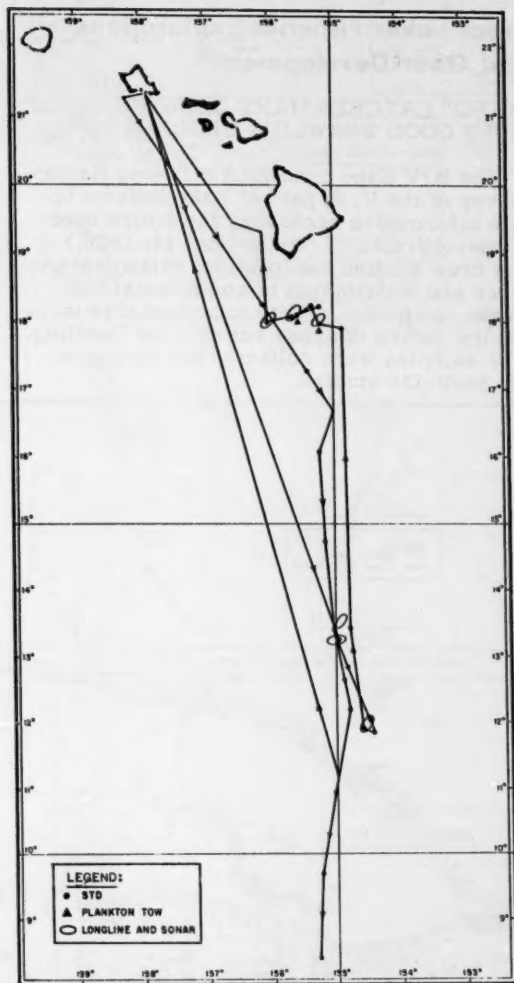
Sonar surveys from the surface to a depth of 400 m. were made in areas where the top of the thermocline to the bottom was 30-200 m. deep (lat. 12° - 13.5° N.) and where it was 60-300 m. deep (lat. 18° N.) along long. 155° W. In addition to the three 24-hour periods of sonar surveys in each area, there were 3 longline stations and 6 days' watch of standard bird flock and surface school in each area. Table summarizes the sonar and watch results. Conclusions must await closer examination of the effects of variable sea conditions and sonar performance encountered during the cruise. The skipjack sighted were small--ranging from an estimated 25 cm. to a measured 40 cm. in fork length. The 3 schools of skipjack were not accompanied by birds.

Numbers of Sonar Targets, Bird Flocks, and Fish Schools

Position	No. of Sonar Targets		No. of Bird Flocks	No. and Species of Fish Schools
	Surface	>10 m.		
12° - 13.5° N., 155° W.	10	31	5	5 unidentified, 3 skipjack.
18° N., 155° W.	8	14	2	2 unidentified.

Another mission of the cruise was to examine the relation between depth of targets located by sonar and the temperature, light, and salinity profiles of the environment.

STD casts to 500 m. were made at the beginning of each sonar survey and after each setting of the longline. Strong winds and changing light conditions precluded the successful use of the irradiance meter. In the shallow thermocline area, the 31 nonsurface targets (>10 m. deep) were distributed irregularly in depth, but they were found at al-



Track chart for Townsend Cromwell, Cruise 28.

most all depths down to 284 m. The most noticeable gap in distribution was between 130 and 160 m. and generally coincided with the depth of the salinity minimum. In the deep thermocline area, 11 of the 14 nonsurface targets were at 90-160 m., 2 at 20-40 m., and 1 at 240-250 m.

The Cromwell also collected temperature and salinity data to and from operation area and recorded and transmitted routine BT and weather information.

Note: For more information, contact Area Director, Bureau of Commercial Fisheries, P.O. Box 3830, Honolulu, Hawaii 96812.

ULO

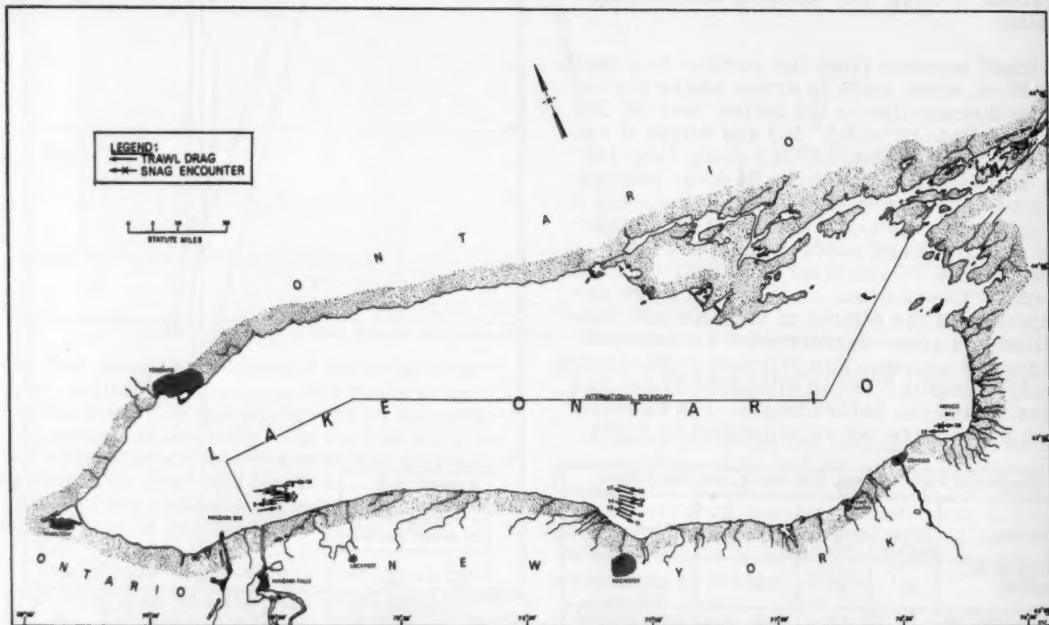
Great Lakes Fisheries Explorations and Gear Development

"KAHO" CATCHES MANY ALEWIFE, FINDS GOOD TRAWLING GROUNDS

The R/V Kaho conducted a 15-day fishing survey of the U. S. part of Lake Ontario to gain information necessary for future operations. (Cruise 37, ended Nov. 15, 1966.) The crew studied the location, relative abundance and distribution of commercial fish stocks, their availability to bottom trawls, and the nature of areas suitable for trawling. Fish samples were collected for biological and pesticide studies.

cordings revealed extensive and widely distributed schools from one end of U. S. part to the other.

Fishing Results: Total production was 8,539 pounds--97.6 percent alewife and 2.3 percent smelt--taken in only 9 hours and 50 minutes of fishing time. Other species amounted to only 7 pounds. Commercially significant catches of alewife of 700,440 and 900 pounds per drag were taken off Niagara Bar at 20, 25, and 45 fathoms, respectively. Off Rochester, 4 drags produced 630 to 1,500 pounds of alewife (average 1,158 pounds) at 15 to 30 fathoms. The best catches of smelt (40 and 30 pounds) off Rochester were taken at 15 and 20 fathoms.



Lake Ontario explorations, R/V Kaho Cruise 37.

Highlights: (1) Large catches, almost all alewife, as large or larger than those in Lake Michigan during this time of year. (The 1966 forecast for the new Lake Michigan alewife fishery was for over 30 million pounds.) (2) Ideal bottom trawling grounds extending from 10 to 50 fathoms along most of Lake Ontario's south shore. Exceptionally good trawling grounds were found minutes away from Youngstown, N. Y. (Niagara Bar) and Rochester, N. Y. Continuous echo-sounder re-

Hydrographic Data: Bottom (fishing) temperatures ranged from 41° F. to 43° F., surface temperatures ranged from 44 to 46 degrees.

Note: For more information, contact **East Director, Exploratory Fishing Base, BCF, 5 Research Drive, Ann Arbor, Mich. 48103.**



Alaska Fisheries Explorations and Gear Development

"MANNING" CONDUCTS SHRIMP SURVEY OFF SOUTHEAST ALASKA

The M/V John R. Manning returned to Juneau December 16, 1966, after a 6-week exploratory shrimp survey in the Icy Strait and Ernest Sound areas of southeast Alaska (Cruise 66-4).



Fig. 1 - General area of operation, Cruise 66-4.

Principal cruise objectives: (1) to locate commercial concentrations of the larger pandalid species, spot shrimp (*Pandalus platyceros*) and coonstripe shrimp (*P. hypsionotus*), and (2) to test the relative fishing efficiencies of 6 types of shrimp pots. Secondary objectives: to gain information on the catching efficiency of tickler chain-rigged and roller gear-rigged shrimp trawls.

Best catches of shrimp in the northern area (see figure 2) were made in Charpentier Inlet, Glacier Bay, where 15 strings set between the 47 and 84 fathom depth contours produced 240 pounds of coonstripe shrimp. These shrimp averaged 19.85, and ranged from 15 to 28 whole shrimp per pound.

Four drags were made with the 40-foot shrimp trawl, 3 with the tickler chain-rig, and one with the roller-rig. A significant reduction in numbers of crabs, miscellaneous invertebrates, rocks, and other debris occurred in the set with the roller-rigged trawl.

In general, commercially significant quantities of shrimp were not located in the northern area of operations.

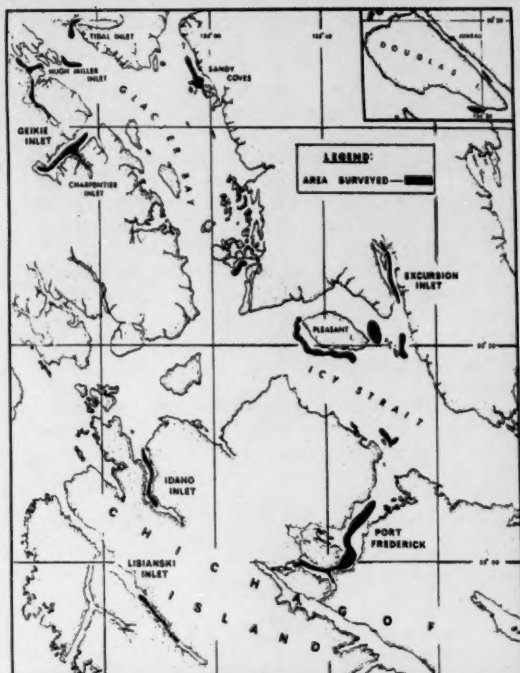


Fig. 2 - Northern area of operation, Cruise 66-4.

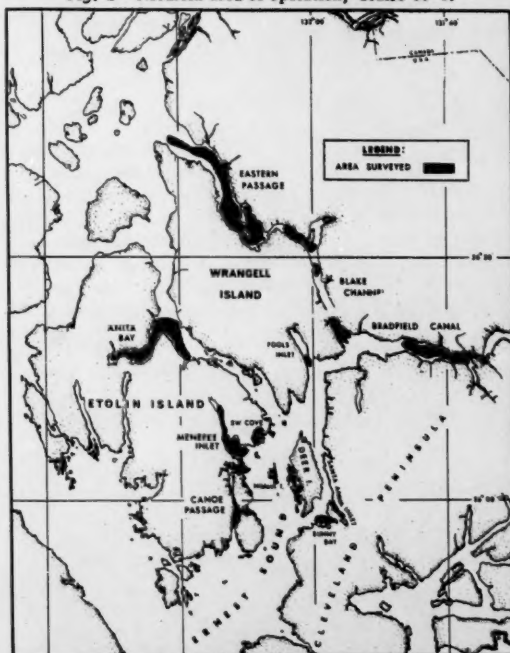


Fig. 3 - Southern area of operation, Cruise 66-4.

South Area Has Commercial Quantities

Results from the southern area (see figure 3) indicate that commercial quantities of spot shrimp are available in the lower section of Ernest Sound, on the eastern side of Etolin Island, between the 22 and 84 fathom contours. Six strings set in Canoe Passage produced 64.8 pounds of 20 count spot shrimp. Twelve strings set in Nenefee Inlet produced 65 pounds of 8 count spot shrimp, and 19.2 pounds of 24 count coonstripe shrimp. Six strings set in Southwest Cove captured 97.3 pounds of 9 count spot shrimp, while 6 strings set just north of Canoe Passage captured 40.4 pounds of 13 count spot shrimp.

Catches of over one pound per trap are considered commercially significant. The average size of the cocktail size (spot) shrimp taken was 11.4 per pound whole weight, and ranged from 4 to 20 count.

Note: For more information, contact Base Director, Exploratory Fishing and Gear Research Base, BCF, P.O. Box 1668, Juneau, Alaska 99801. Telephone: 586-7233.



North Atlantic Fisheries Explorations and Gear Development

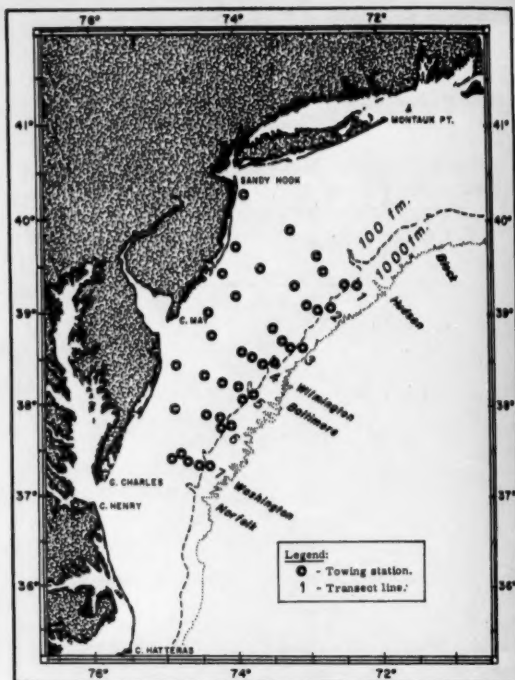
"DELAWARE" EXPLORES CONTINENTAL SHELF SLOPE

The M/V Delaware returned to her home port of Gloucester, Mass., on December 15, 1966, after completing the first in a series of cruises planned to survey seasonally the trawl fisheries resources of the Middle Atlantic Bight area--Hudson Canyon to Cape Hatteras (Cruise 66-11). A second winter cruise was scheduled for February 1967 to complete the area not covered in the first.

Generally, catches of fish have been fairly small. Except for scup and lobster, the quantities of fish and shellfish found probably were not of commercial significance.

Procedure

The survey area is to be sampled systematically by fishing the same stations during each season. The stations have been arranged in transect lines extending across the general slope of the bottom from near the coastline to the Continental Slope. The lines are spaced



Survey area of M/V Delaware Cruise 66-11.

about equally and, generally, about perpendicular to the coast. There are 12 transect lines between the western side of Hudson Canyon and the offing of Cape Hatteras.

Fishing stations are positioned along the transect lines at depths of 10, 20, 35, 50, 75, 100, 250, 400, 600 (and possibly 800) fathoms. However, minor changes in positions (and transect lines too) are required sometimes because of known wrecks, hard bottom telephone cables, submarine transit lanes, etc.

Commercial style fishing gear is used: roller rigged, nylon, #41 "Yankee Trawl" nets (70-foot headrope, 100-foot footrope) with suitable size, commercial type, bracket hung doors (10' 6" length).

Results

During cruise 66-11, 42 stations were fished--40 at planned sampling stations, 2 in unscheduled depths or positions. The crew fished all planned stations on the Continental Shelf between 10 and 100 fathoms, inclusive, lying between Hudson Canyon and the offing of Wachapreague Inlet Buoy, about 35 miles northeast of Cape Charles--except for two

10-fathom stations at transects 6 and 7. The area covered is about two-thirds of the Shelf area to be surveyed; the February cruise is scheduled to fish all Slope stations.



An inshore catch before and after emptying into checker.

Although many of the scup (*Stenotomus versicolor*) were of maximum size, the amount taken probably would not sustain commercial fishing except for draggers with smaller crews. Several commercial fishing vessels were observed trawling near the Delaware's best scup catches.

Lobsters (*Homarus americanus*) occurred in 30 of the 32 catches taken from 35 fathoms or more. However, the best quantities were taken in 100 fathoms. The largest catch was 5 bushels, weighed 190 pounds, and was taken on a 1-hour tow (position: 1H4-4188; 1H5-2690).

Only 6 berried females were in it. In contrast, one 4-bushel catch taken at 75 fathoms contained 38 egg-bearing females.

Squid were the most prevalent species found and occurred in all except 2 catches. Largest was 8 bushels from 1-hour tow at 75 fathoms. Two species were mixed in catches: common (*Loligo pealii*) and sea arrows (*Ommastrephes illecebrosa*).

Dogfish (*Squalus acanthias*) were most abundant in about 35 fathoms or less, but were taken to depths of 100 fathoms.

Note: For further information, contact Dr. John R. Thompson, Acting Base Director, or Ernest D. McRae Jr., Exploratory Fishing and Gear Research Base, State Fish Pier, Gloucester, Mass., 01930, Telephone: 617-283-6554.



What A Tuna Can See

A skipjack tuna can distinguish an object the size of a pinpoint 2 feet away from its nose. Other fishes that live in the upper levels of the ocean also are remarkably sharp-sighted, scientists are finding.

For several years, Eugene L. Nakamura, biologist at BCF's Biological Laboratory, Honolulu, has been studying the vision and behavior of the commercially important tunas. The laboratory has conducted other processing investigations in this field. Using his techniques, the Laboratory has been able to keep tunas alive for research in its shore-side tanks for months on end. It is the only place in the world where these large and active fish are regularly available for experiment.

The skipjack tuna (*Katsuwonus pelamis*), a relatively small and very plentiful fish, is of particular interest to the Laboratory because it forms the mainstay of Hawaii's chief commercial fishery. Also, several studies conducted by the Laboratory indicated that a very large, untouched stock exists in the central Pacific.

Nakamura has been studying the ability of tunas to see clearly the fine details of objects, especially as they become smaller and move closer together. Few such measurements of any fishes existed, and none of the much-sought fishes of the high seas.

Worked In Sunless Tank House

He worked in a black-painted, sea-water tank house in a sunless building. At the end of the long, narrow tank there was an opal glass plate on which an image could be projected. The image had a pattern of black-and-white stripes of equal width.

A fish soon learned that if the stripes were vertical it would receive a morsel of food at a certain place in the tank. However, if the stripes were horizontal, and it tried to swim to the food-drop area, it would receive no food--and, to impress the lesson upon it, a mild electric shock.

When the fish was trained and testing began, horizontal and vertical stripes were presented at random. The luminance of the stripes was decreased in steps until the fish began to make errors in half the tests. On following days, the fish would be presented with patterns in which the stripes were narrower or broader. In this way, the visual acuity of the skipjack and a related species, kawakawa, or little tunny, was determined.

Nakamura found that when the white stripes were dim, the fish saw about equally well, but when they were brighter, the skipjack's visual acuity was greater.

There is evidence that sight is important to tunas in detecting prey and avoiding predators. Nakamura says it also is used to recognize transient and permanent body marks. Several fishes exhibit transient color markings at certain times, such as feeding or courtship. These markings may convey information about the presence of food to other fish in the school, or signal aggressive intentions. Certain permanent body marks may aid a fish distinguish its own kind from others closely resembling it.

Can See Pinpoint On Clear Day

Nakamura was able to calculate from his measurements how far the skipjack could see prey or body marks under certain conditions. On a clear day, a skipjack tuna about 100 feet down could see an object a few hundredths of an inch long 2 feet away. It could see the transient vertical bars on the flanks of another skipjack about 35 feet away. Permanent body marks on another skipjack would be resolvable at distance of about 10 feet. Nakamura points out, however, that contrast be-

tween the object and its background may be as important, or even more, than visual acuity; he was unable to measure contrast. He reports that British workers recently found that the scales of some fishes are ingeniously oriented to reduce contrast between their bodies and the background.

What Nakamura's studies may mean to the fishermen lies in the possibilities they offer of devising improved new gear and techniques for catching fish. Such gear and techniques would be based on scientific studies of the fishes' perceptual abilities and knowledge of their behavior.



La Jolla First to Raise Mackerel and Sardines to Advanced Juvenile Stage

Pacific mackerel and sardines have been raised from egg to "advanced juvenile stage" for the first time anywhere by researchers of the California Current Resources Laboratory at La Jolla.



Fig. 1 - Pacific mackerel, 6-8 inches long, reared from the egg, photographed during the week of October 10. Fish were hatched May 20, 1966.

(Photo: George Mattson)

Several hundred Pacific mackerel hatched in May 1966 reached 10 inches by year end, attained about half the adult size. Sardines hatched in August 1966 were four inches long, about one-third adult size. Using an experimental aquarium supplied with sea water, Dr. George O. Schumann has reared at least 15 species of marine fish from egg to late juvenile stages.

Dr. Schumann notes: "A key to the success of these experiments is to feed the

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proper food at the proper time." He reported that very young fish were fed small amounts of natural plankton (microscopic ocean plants and animals). As the fish grew, they were fed larger amounts of plankton, and also brine shrimp. With a lot of food and warm water some species more than doubled in length during their first two weeks of life.

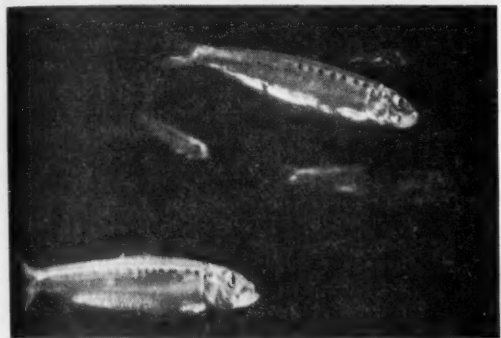


Fig. 2 - Sardines, $2\frac{1}{2}$ to 4 inches long (standard length) photographed during the week of October 10. School has about 50 specimens with a rather wide difference in size. The sardines shown were hatched August 11, 1966. (Photo: George Mattson)

Studies Needed For Conservation of Species

Dr. E. H. Ahlstrom, Laboratory director, said Pacific mackerel and sardines are being studied to gather information needed to conserve and manage the species. "Our successful experiments will enable scientists to study the life history and habits of these fish under controlled conditions. This is one of the most important recent developments in marine fishery biology. Information on marine fish larvae and factors influencing survival will enable scientists to better understand changes in abundance of commercial fish populations. "Rearing and studying the larvae in the laboratory will ultimately provide information leading to international cooperation in regulating the high seas fishery."

Pacific mackerel are an important West Coast fishery. But sardines, the mainstay of a prosperous fishery in the mid-1940s, have become scarce.



La Jolla's Tuna Vessel Research Pays Off

The results of a study by BCF's Tuna Resources Laboratory at La Jolla and a Van Camp Seafood Co. representative have stimulated a tuna vessel fleet owner to convert its vessels for maximum efficiency at relatively modest cost. The study determined the optimum size of tuna vessels that would give maximum return for the effort and money expended. Based on the study, National Marine Terminals of San Diego has started to convert its 12 vessels from about 340 tons carrying capacity to 420 tons--a figure close to the most efficient size of tuna seines disclosed by the study.

The cost of converting each vessel is \$75,000. When the project is completed, the fleet's carrying capacity will be 960 tons greater--equivalent to adding 2 new vessels costing \$2 million. The company believes the \$900,000 program is worthwhile.

BCF's support of its La Jolla Operation Research Program during the study period was much less than \$50,000.



King Crab Waste, A Pollutant, Becomes Salable Fish Meal

BCF's Ketchikan (Alaska) Technological Laboratory has used king crab waste to make fish meal, a development that may help to reduce pollution in Kodiak harbor and provide additional income to the king crab industry.

The pollution situation became a real concern to Kodiak when the post-earthquake buildup brought an increasing number of processors and vessels to the area. It was estimated that about 300,000 pounds of butchered waste were dumped into the harbor daily during the peak of the 1965 processing season. The City of Kodiak was forced to enact a stringent pollution-control ordinance.

The reduction process for making meal from crab waste is much easier than it is for other fish byproducts because expensive cookers, presses, and oil recovery equipment are not necessary.

The Ketchikan technologists began to study the possible use of crab meal as animal feed. Using butchering waste only (shell, viscera, and blood), they produced a small quantity of meal containing about 45 percent protein--a surprisingly large amount. If this protein has the same nutritional value (digestibility) as fish meal, it now would be worth \$105-\$120 a ton.

The technologists went on to a more elaborate experiment. They obtained 5,000 pounds of crab butchering waste and processed it. About 600 pounds will be fed to mink at Petersburg in a cooperative study with the Experimental Fur Farm. The remainder will be used in feeding trials with rats and chickens at the BCF lab in College Park, Md., to compare crab meal protein with fish meal. If the results are favorable, the production of crab meal could lessen the pollution problem at processing centers and add income to the industry.



Holds Sanitation Workshops to Aid Industry

To help several elements of the food processing industry cope with the increased sanitation surveillance of the Food and Drug Administration (FDA), FDA's Bureau of Education and Voluntary Compliance and BCF's Technology and Inspection staff are initiating sanitation workshops for the breaded shrimp and smoked fish processing industries.

The workshops, scheduled to start in early spring, will be held in the Gulf States and in New York City.



Boothbay Lab Studies Lobster Habitat Improvement

An artificial reef built with rock blasted and dredged from the site of a new Coast Guard station is being studied intensively by the BCF Boothbay Harbor (Maine) laboratory's SCUBA diving team. The information gained may help determine the best ways to construct new areas suitable as lobster habitat--and also ways of upgrading marginal areas.

A photographic survey is being made of the reef, which covers about 10,000 square feet of ocean bottom near the mouth of Boothbay Harbor, Maine, in 50 to 80 feet of water. This reef is only 2 months old, but the apparent density of lobsters is already half that of an adjacent natural habitat. Bimonthly photographs of reef parts will document the colonization of the reef by marine organisms; the lobster population will be monitored each month. Besides lobsters, shorthorn sculpins, cunners, and rock eels occupy the reef.



Gloucester's Prototype Shrimp Separator Shows Merit

A shrimp separator designed, built, and tested by the Gloucester Exploratory Fishing Base staff has proved successful in separating small shrimp from trash fish and debris taken together in shrimp trawling operations. Because the shrimp are small and bring a low price, the mechanized separator may make this new fishery more attractive to potential fishermen.



Atlantic Tuna Tagging Shows Definite Trans-Ocean Migration

Of 7,000 tagged tuna released in the Atlantic during 1966, over 600 returns were made during the first 10 months, some from fish tagged in earlier years. It was the second year of BCF support of the program at the Woods Hole Oceanographic Institution.

Several returns were unusually significant; they indicated the complex relation between stocks of Atlantic bluefin tuna. Twelve recoveries showed trans-Atlantic migration of young bluefin released in coastal waters between New Jersey and Cape Cod in summer 1965 and recaptured in Bay of Biscay in summer-early fall 1966. Young bluefin tagged by the Canadians showed a similar migration.

The high number of returns indicates a definite trans-ocean migration rather than accidental wandering.

East-West Migration Unknown

Although young bluefin have been tagged in the northwest Atlantic every year for 13 years, the only similar migration of young fish ever recorded was for two 20-pounders released in 1959 and recaptured in Bay of Biscay in 1959. Until tagging can be done in the Biscay, it will not be possible to know if east-west migration occurs. In the past, giant bluefin marked in Florida straits have been recaptured in Norwegian waters, one even north of Arctic Circle.

It appears that widely separated bluefin tuna stocks intermingle in unpredictable manner. International programs would be necessary to determine their complex distribution.



BCF Ann Arbor Base Explores Idea of Using LASER for Fish Detection

The possibility of using light amplification by stimulated emission of radiation (LASER) to penetrate the sea's air-water interface to locate and delimit fish schools is being explored by the staff of BCF's Ann Arbor Exploratory Fishing and Gear Research Base. Recently, the matter was discussed with engineers of a private laboratory, who proposed a feasibility study.

This is the approach of the Ann Arbor staff: if the interface can be penetrated--and reflected signals from fish schools returned--then it may become possible to conduct searches for fish schools from fast-moving vehicles such as planes or helicopters. A logical place to start testing would be over a known population of highly abundant schooling fish--using the reliable recordings of echo sounders aboard research vessels to establish the quantity of fish and to help interpret the LASER readings.

BCF's Seattle Base also is interested in the subject.



Menhaden Eggs Found Off North Carolina

A concentration of live menhaden eggs and a spawning area were found for the first time off the Middle and South Atlantic coasts by BCF scientists from the Beaufort, N. C., laboratory aboard the research vessel "Dolphin" on December 17, 1966.

The fairly dense patch of eggs, roughly 5 miles in diameter, was located about 40 miles southwest of Beaufort, N. C. Three stages of embryonic development were represented: blastoderm (about 14 hours), early neurula (24 hours) and late embryo (46 hours). Over 100,000 live eggs and newly hatched larvae were brought into the laboratory for further study of embryonic development.

The area was revisited 36 hours after the discovery and only dead eggs or yolk-sac larvae were caught. This indicates to the scientists that no further spawning had taken place, and that survivors had been carried from search area by winds and currents.



BCF Offers Reward for Tagged Fluke

Cooperating in a study by the Atlantic States Marine Fisheries Commission, BCF is offering rewards for catching tagged fluke: \$1.00 for return of tag only; \$2.00 for tag intact on the fish.

The fluke are young of the year--tagged in October 1966--when only 3 to 4 inches long. They were tagged in Bay River, Pamlico Sound, N. C., to determine how far they migrate--and whether they contribute to stocks of fluke taken farther north and east of the tagging area.

The tagged fluke are extremely small and commercial fishermen are urged to watch carefully the parts they usually discard. The help of fishermen or anyone handling fish is needed to make this study successful.

Recaptured flounder provide necessary information on migrations and growth rates of this valuable sport and commercial fish.

How To Get Reward

The tag is green, plastic, oblong, small ($\frac{1}{8}$ inch wide x $\frac{1}{2}$ inch long), and is attached to the fish by wire. It shows the message-- "SEND TAG: USFWS WOODS HOLE, MASS."

To receive reward for tag only, send it to U. S. Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Mass., with this information: (1) your name and address;

(2) where fish was caught; (3) when caught; and (4) type of gear used. To receive reward for tag intact on the fish, give it to a Federal or State Marine biologist or fisheries agent for observation and measurement, together with your name, address, and other pertinent information.

Prompt acknowledgement will be mailed in both cases with a cash reward and information on the fish tagging.



NOTE: The December 1966 issue of this magazine, page 24, "Boston Trawlers Improve Fish Handling Methods," described an improved fish washing system recently adopted by some Boston trawlers. BCF did not devise the system. The washer is the product of the Great Grimsby Coal, Salt, and Tanning Company, Limited, Grimsby, England; the hatch was designed by Usen Trawling Company, Boston, Mass.

SEA FOSSILS INDICATE MOVEMENTS OF SEA FLOOR

Africa and the Americas may have separated about 160 million years ago, drifting apart at the rate of six-tenths of an inch a year. As reported by scientists of the Lamont Geological Observatory, Columbia University, N. Y., inspection of fossilized sea creatures has shown that for the past 20 to 25 million years the continents have stayed where they are.

Well-preserved samples of fossilized marine animals five-thousandths of an inch in diameter were dredged from two sites on the crest of the undersea ridge that runs down the middle of the Atlantic Ocean. The fossils called foraminifers and coccoliths were dated from the early Miocene epoch about 25 million years ago.

Some scientists have calculated that the crest of the undersea ridge is much younger than the flanks and that the ocean floor crusts become progressively older toward the continents. These scientists adhere to the theory of continental drift--the idea that the continents were once joined together and then drifted apart through the ages to create the Atlantic and Indian Oceans. Other scientists oppose the drift theory saying that the locations of the continents, ocean basins and crust are permanent. (Reprinted, with permission from Science News, weekly summary of current science, c 1966 by Science Service, Inc.)

INTERNATIONAL

U. S. and Japan Discuss New U. S. 12-Mile Zone

On January 3, 1967, U. S. and Japanese delegations concluded preliminary talks in Washington concerning the continuation of Japanese fishing operations in the new U. S. fisheries zone established by Public Law 89-658 in October 1966. The new law extends U. S. jurisdiction over fisheries to 9 miles from the 3-mile territorial sea, or a total of 12 miles from the coast. It provides for continuation of traditional foreign fishing in the new zone recognized by the U. S.

The U. S. said the extension of its jurisdiction was consistent with international law. However, it indicated readiness to hear and consider the Japanese views on the law and the continuation of their fisheries in the new zone.

Japanese Disapprove

The Japanese said they could not approve the unilateral establishment of such a fishing zone. Under international law, they declared, their fishing vessels should not be prevented from conducting fishing activities freely in the zone unless Japan agrees. They presented data which, in their view, indicated that Japan had conducted various kinds of fisheries in the 12-mile zone--in the Bering Sea, the Pacific Ocean, the Gulf of Alaska, and the Atlantic Ocean.

Despite the difference, the delegations discussed possible arrangements concerning Japanese fishing operations in the new zone.

Discussions were expected to resume February 6.



Central American Fisheries Development Commission

HOLDS FIRST MEETING IN SAN SALVADOR

The Central American Fisheries Development Commission (CAFDC) held its organizational meeting in San Salvador from Novem-

ber 7-10, 1966. Thirty-five delegates and advisors came from Central and South American countries (including Mexico) and the United States and international organizations (such as UN's Food and Agriculture Organization).

CAFDC will manage a 6-year, jointly financed fishery development project. Dr. Vasconcelos, the FAO-designated Project Director, outlined the regional situation, its prospects, and the proposed work plan for the year ahead. Some international experts already are available to carry out parts of the project. The first exploratory fishing vessels have arrived in the area.

A country-by-country rundown of national fisheries developments showed that fisheries to date have been largely neglected. The exception was Panama, which has made considerable progress in recent years, largely because of private enterprise.

Manuel Rafael Arce, El Salvador's Subsecretary of Economy, was named President of CAFDC, and Rodrigo Salmerón, Nicaragua's Vice-Minister of Agriculture, Reporter.

Regular meetings of CAFDC will be held about every year, but meetings may be called at any time to discuss urgent matters. The next regular meeting will take place in San José, Costa Rica. (U. S. Embassy, Guatemala, Nov. 25, 1966.)



FAO Conducts Orientation Cruise for Barbadian Fishermen

Barbadian trainee fishermen adjusted satisfactorily to long-line fishing, a method new to Barbados, during the first orientation cruise of the "Calamar," one of two 82-foot multipurpose exploratory vessels provided by the UN's FAO for its Caribbean Fisheries Development Project. Exploratory fishing operations for the entire project are under BCF direction through a contract with FAO.

The Calamar, based in Bridgetown, Barbados, returned with yellowfin and albacore tuna, swordfish, blue marlin, sailfish, and shark.



Law of the Sea Conventions

MEXICO AGREES TO ALL 4 CONVENTIONS

Mexico has agreed to the 4 conventions in the Law of the Sea Conventions: on the Territorial Sea and the Contiguous Zone, the High Seas, Fishing and Conservation of the Living Resources of the High Seas, and on the Continental Shelf. (Department of State.)



Asian Tuna Conference Postponed Until Spring

The Asian tuna conference between Japan, South Korea, and Formosa, originally scheduled for Tokyo December 1966, was postponed until spring 1967 because Formosa could not attend. (Okinawa will attend as an observer.) The conference was proposed by the Japan Federation of Tuna Fishermen's Cooperative Associations (NIKKATSUREN).

The three countries will discuss common fishery problems and seek ways of preventing disruption of tuna prices in the export market. ("Suisan Keizai Shimbun," Dec. 9, 1966.)



12th International Congress of Refrigeration

TO MEET THIS SUMMER

The XIIth International Congress of Refrigeration will be held in Madrid, Spain, August 30-September 6, 1967. The quadrennial Congress will examine the progress made by science, technology, and economics in refrigeration. More than 2,000 participants are expected. Previous meetings were held in Vienna, Chicago, London, Rome,

Buenos Aires, The Hague, Copenhagen, and Munich.

The program will include 3 plenary sessions: 1st session: (a) low temperatures in generation and transmission of electric power; (b) latest developments in insulating materials and techniques; 2nd session: (a) liquefaction, storage, and transport of natural gas; (b) refrigeration as applied to desalination of sea water and brackish water; 3rd session: aids to refrigeration for preservation of perishable foodstuffs.

Also, the 9 scientific and technical committees of the International Institute of Refrigeration will meet to discuss reports to the Congress.

For additional information write: General Secretariat, XIIth International Congress of Refrigeration, Centro-Experimental del Frio, Serrano, 150, Madrid-6, Spain.



Scandinavian Nations Agree on Access to Skagerrak and Kattegat

Norway, Denmark, and Sweden have signed an agreement that will permit mutual access to nearby waters of the Skagerrak and Kattegat Seas. Each country will be permitted to continue fishing in those waters within 4 nautical miles of the coastal base lines of the other two.

The Norwegian law extending fisheries jurisdiction to 12 nautical miles went into effect January 1, 1967. Denmark has proclaimed coastal base lines and is expected to put into effect a 12-mile fishery jurisdiction early this year. Swedish fishing limits are still 4 miles. (U. S. Embassy, Oslo, Nov. 20, 1966, U. S. Embassy, Copenhagen, Dec. 22 and 29, 1966, and other sources.)



FOREIGN

CANADA

BOASTS NEW RESEARCH VESSEL "E. E. PRINCE"

Memories of fisheries research in its infancy were revived at the christening of Canada's 130-foot research vessel E. E. Prince on September 17, 1966. The vessel, honoring the first head of fisheries research in Canada, will operate on the Atlantic coast out of St. Andrews, New Brunswick.



Christening of research vessel E. E. Prince.

Fishing trials were completed in December 1966. Several short research cruises are planned before the vessel undertakes the high-seas studies for which it was designed.

It will have a maximum range of 3,000 miles and cruising speed of 11 knots. The vessel is capable of stern trawling at various depths, scallop dragging, and long-lining. A modern instrument of fisheries research, it includes laboratories, specialized instrumentation for fish-finding, weather and oceanographic observations, and navigational aids. Unique features include a flume stabilization system that stabilizes the ship at sea. The system will give seamen and scientists an unusually steady platform essential to many research operations at sea.

Specially designed hinged gallows have been installed for lowering and retrieving trawls. Two hydraulic trawl winches, each capable of exerting a pull of four tons at 240 feet per minute, have been fitted to operate in synchronization or independently. A

separate winch has been installed to permit taking oceanographic samples. The propulsion machinery, located amidships, is a non-reversing direct-drive diesel engine rated at 600 British horsepower coupled to a four-bladed, controllable-pitch propeller.

Navigational and fishing aids include two radars, three echo-sounders, gyro compass, automatic pilot, Loran, Decca naviator, and radiotelephones.

The E. E. Prince will have a primary role in deep-sea programs involving pelagic species such as herring, tuna, and swordfish. But she is equipped to perform in many fields of marine research. ("Fisheries of Canada," vol. 19, no. 5, Canadian Department of Fisheries.)

EXPANDS EAST COAST FLEET AND PROCESSING FACILITIES

Canada added 15 new stern trawlers to her east coast fleet in 1966 at an average cost of about US\$1 million per vessel. Most of them are 150-155 feet long and can hold about 400,000 pounds of fresh fish. Other vessels included 11 steel side trawlers ranging from 90 to 140 feet, 5 scalloper-groundfish draggers averaging about 110 feet, and 4 wood long-liners averaging 96 feet. Also, two 110-foot vessels were converted into herring purse-seiners. Several vessels under 90 feet also were added. Subsidies up to 50 percent of construction costs aided the fleet's expansion. Processing plant expansion in herring and groundfish industries also stimulated demand for new vessels.

And Vessels On Order

Large vessels on order include four 151-foot stern trawlers for a firm planning to open a large groundfish processing plant at Canso, Nova Scotia, in 1967; four 169-foot stern trawlers for the expanding Harbour Grace, Newfoundland, operation of another firm; and several stern trawlers of about 150 feet for a third firm opening a 60-million-pound a year groundfish processing plant near Marystown, Newfoundland.

Canada (Contd.):

The Marystown plant proposes to pay its trawler crews a guaranteed annual wage (from \$3,300 for deckhand to \$12,000 for captain); also, crews would divide a bonus of 15 percent of the gross value of the catch. Crew members would be granted time off without reduction in the guaranteed annual wage on the basis of one trip off in each five the vessel makes to the fishing grounds. ("Canadian Fishermen," Dec. 1965-Jan. 1966 and other sources.)

* * *

BRITISH COLUMBIA CANNED SALMON PACK WAS DOUBLE 1965's

The British Columbia canned salmon pack in 1966 of 1.8 million cases was double the pack of 1965 and the largest since 1962. The pink salmon pack made up 50 percent of the 1966 total and was the largest since 1962; the pack of sockeye salmon was at the highest level since the 1958 record.

* * *

FISHING LICENSES PUT ON FISCAL YEAR BASIS

The validity period for the commercial fishing licenses in Canada has been changed from calendar year to fiscal year. Annual licenses in the future will be valid from April 1 to March 31. (Canadian Department of Fisheries, Dec. 21, 1966.)

British Columbia Canned Salmon Pack, 1961-1965						
Species	1/1966	1965	1964	1963	1962	1961
			(Standard 48-Lb. Cases)			
Sockeye	407,067	245,798	343,359	158,375	297,717	398,236
King (spring)	14,548	18,891	9,127	10,000	7,174	7,927
Steelhead	2,478	843	1,262	771	815	979
Blueback	21,143	21,300	36,259	11,384	12,097	12,527
Silver (coho)	260,276	273,984	168,473	146,099	175,638	234,047
Pink	950,555	287,925	464,107	757,452	1,188,661	661,458
Chum	160,436	65,216	232,721	119,190	134,483	95,400
Total all species	1,816,503	913,957	1,255,308	1,203,271	1,816,585	1,410,574
1/Includes cases packed from salmon imported from the United States as follows: sockeye 23,057; spring 65; coho 857; pink 8,334; chum 966.						
Source: Canadian Department of Fisheries, Pacific Region, Vancouver, B. C.						



ABOUT CARP

The carp, which belongs to the minnow family, was brought into the United States in 1876. Originally native to China, it was transported to Europe in the thirteenth century. In the sixteenth, it was carried to England. Now it may be found anywhere in the world.

In the Great Lakes, commercial fishermen catch over five million pounds each year.



Carp

LATIN AMERICA

Brazil

EXPLAINS ADOPTION OF 12-MILE LIMIT

In November 1966, Brazil extended its fisheries jurisdiction to 12 miles. The Ministry of Foreign Affairs explained that the new limits are based on international practice and bring the Brazilian territorial sea and fisheries zone into line with those of Uruguay and Argentina. The Ministry stated, too, that the measure was urgently needed to defend Brazilian fisheries interests. Developing nations that possess fisheries resources can no longer permit other nations possessing large and technically advanced fleets to exploit these resources. (U. S. Embassy, Rio de Janeiro, Dec. 6, 1966.)



British Honduras

LOBSTER IS BY FAR NO. 1 FISHERY EXPORT

The export of frozen spiny lobster tails to the U. S. is an increasingly important source of foreign exchange and employment. Of 1965 fisheries exports worth US\$500,000, lobster exports earned US\$455,000. The Government places a quota on the annual spiny lobster catch, which is allocated only to local fishermen organized in cooperatives. U. S. firms handle marketing and, sometimes, finance the coops. The partnership is said to benefit both parties.

The 1966 production was expected to drop due to lower prices and catches down 40 percent from 1965. The spiny lobster season runs from July 15 to March 14 and is closely controlled by the Government. The 1966 export quota of 451,000 pounds of lobster tails was above the 1965 seasonal production of 418,300 pounds.

To date, only spiny lobsters have been exploited. Local fishermen seldom venture beyond the coast's shallow waters, which are protected by the world's second longest barrier reef. Marine scientists believe, however, that other species--shrimp, for example--are potential commercial fisheries.

Deep-sea fishing seems promising but, so far, lack of research data, economic fishing methods, and developed overseas markets have prevented exploitation of these fishes. (U. S. Embassy, Belize City, Nov. 30, 1966.)



Chile

FISH MEAL AND OIL PRODUCTION UP FIRST 8 MONTHS 1966

Production of fish meal during January-August 1966 was 169,200 metric tons, markedly above 1965's 93,100 tons and nearly equal to 1964's record 174,700 tons. Fish oil production during the same period reached 16,600 tons, sharply above the 10,400 tons produced in 1965 and near the 17,600 tons of 1964. The increase reflects a larger catch following the anchovy's return in December 1965. Although prices were lower than 1965, export earnings for fish oil and meal in 1966 were expected to be substantially above 1965.

In 1965, exports of fish meal and oil totaled 66,935 tons and 7,942 tons, respectively--sharply below the 146,450 and 13,710 tons exported in 1964. This decline resulted from a marked reduction in catch because of the anchovy shortage. The most general explanation of the shortage was higher water temperatures due to a warm current.

Because of the anchovy shortage, the Government prohibited, on March 4, 1966, the "extraction, sale, purchase, transport and possession" of anchovy less than 12 centimeters long. It allowed, however, a 20-percent tolerance in the catch. (U. S. Department of Agriculture, Nov. 7, 1966.)



Venezuela

SHRIMP INDUSTRY FALTERS

The expanding shrimp processing industry of the Maracaibo area was shaken by very poor fishing in 1966. The white shrimp (*Penaeus schmitti*), principal species in commercial production, was in short supply.

Venezuela (Contd.):

Landings of trawlers working in the Gulf through July were a third of the 1965 take; the catch of fishermen on Lake Maracaibo was no more than a fourth of record production. Catches failed to cover trip costs of the trawlers through July. Fishing improved in August and held at break-even level or better through October.

The price of shrimp increased steadily as plants competed for the small supply. The retail price in Caracas climbed to 8 Bolivares a kilogram, heads-on (US\$0.82 a pound).

Principal processing plants remained open through 1966, but production was small. In early November 1966, several were processing sea bobs. Several marginal plants closed but may be expected to reopen when shrimp are plentiful again. The impact was most severe on the thousands of coastal families of the Maracaibo area whose livelihood depends on the industry.

Plant operators are optimistic that the scarcity of white shrimp is a cyclic phenomenon experienced by other countries. Several plants are proceeding with plans to establish their own trawler fleet. Thirteen vessels joined the Punto Fijo trawler fleet since January 1966. Technicians feel confident that the disappearance of the whites was not due to overfishing, though 1965 was a record year. The tagging program designed to establish the migration pattern of the Lake shrimp is underway.

Government Acts

The Government, recognizing the hardship to coastal area fishing families, has moved to coordinate better its field activities. A new Fisheries Office (Oficina Nacional de Pesca) is being organized in the Ministry of Agriculture. It will take over all activities concerned with exploitation and conservation of marine resources.

The Ministry has agreed to modify the fishing zones of the Gulf of Venezuela. The off-limits line stretching from Punto Fijo to Boca Paijana is to be moved back to Punto Fijo-Puerto Gutierrez; this will increase the trawling area, particularly off the mouth of Lake Maracaibo. Trawlers will continue to be barred from fishing within 8 miles of the coastline, but the Government is permit-

ting small trawlers, up to 15 meters, to work the area between 4 to 8 miles of the coastline. The first 4 miles from shoreline will continue to be reserved for net fishermen. The trawler fishermen long have contended that the off-limit line forced trawlers too far out for effective fishing or even safe navigation (most boats do not have communication equipment). (U. S. Embassy, Caracas, Nov. 9, 1966.)



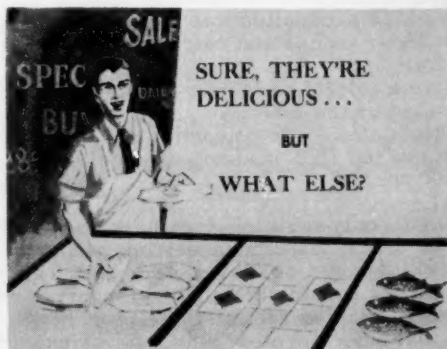
MID EAST

Israel

MULLET SPAWNED IN CAPTIVITY

An Israeli scientist under contract to BCF, through the Foreign Currency Research Program, has succeeded in spawning grey mullet in captivity and now is rearing the fry in aquaria. This important discovery may stimulate the culture of mullet in estuarine areas.

Biologists in the Middle and Far East had been trying for years to induce the grey mullet to spawn in captivity.



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EUROPE

USSR

MOTHERSHIP WHALING OFF JAPAN DISTURBS INDUSTRY

The extension of Soviet mothership-type whaling operations to the northeastern coast of Japan is disturbing to the Japanese whaling industry because it may have an adverse effect on Japan's land-based whale fishery.

The Soviet fleet (one 20,000-ton class mothership and two catcher vessels) was reported November 23, 1966, near 39°20' N. latitude and 144°16' E. longitude (about 127 nautical miles off northeast Japan). This is an area where mothership-type whaling operations are prohibited under Japanese domestic laws to protect the resource. There is growing belief that the Japanese coastal whale fishery operators should persuade the Japanese Government to permit a shift from land-based to mothership-type operations--particularly since land-based operations over the past several years have become less manageable as distance from base to whaling grounds lengthened. ("Suisan Keizai Shimbun," Dec. 1, 1966.)

FISHES OFF MEXICO

Two large stern factory trawlers left the Soviet Far East in mid-November 1966 for the fishing grounds off Mexico's Baja California. Three more vessels were expected to follow. The Soviets were expected to fish for anchovy, sardine, bluefin tuna, and mackerel. A Soviet exploratory fishing fleet during October 1965-March 1966 assessed the abundance of those species and found commercial fishing feasible.

ORGANIZES BERING SEA FISHING EXPEDITION

The Kamchatka Fisheries Administration was preparing to begin flounder fishing in Bristol Bay in mid-December 1966. The Sakhalin Fisheries Administration was getting ready to start herring fishing off the Pribilof Islands. It had dispatched an ex-

ploratory vessel (SRTM-417) to determine the best herring areas. Soviet flounder and herring fisheries in the eastern Bering Sea have been traditional since 1958-1959.

KINDS AND VALUE OF EXPORTS TO U. S. CHANGE

During first-half 1966, the Soviet Union exported to the U. S. 414 metric tons of fishery products worth \$459,000. Frozen shrimp and spiny lobster exports led with 355 metric tons (\$338,000) and 43 metric tons (\$70,000), respectively (table).

U. S. Imports of Fishery Products from USSR, January-June 1966

Type of Product	Quantity	Value
	Metric Tons	US\$
Fresh, frozen, etc.:		
Shrimp, frozen, shell-on . . .	355.1	337,926
Sturgeon roe	2.0	20,110
Spiny lobster tails	5.1	17,952
Lobsters ^{1/}	43.0	70,426
Total fresh, frozen, etc. . .	405.2	446,414
Canned:		
Fish ^{2/}	4.6	5,757
Fish in oil	1.2	1,541
King crab meat	2.8	4,990
Total canned	8.6	12,288
Grand total	413.8	458,702

^{1/}Not otherwise specified, but probably also spiny lobster.

^{2/}Not otherwise specified.

Comparing January-June 1966 with 1965, two trends become apparent: (1) the value of 1966 U. S. imports from the USSR for the first 6 months was already 90 percent of the total value for 1965 (\$505,000); (2) the composition of imports had changed completely--shrimp, whose value in 1965 was only about \$10,000, in 1966 made up two-thirds of the value of all fishery imports. Scallops and cod blocks were not imported in 1966, and traditional canned king crab meat imports were low (\$5,000 in first-half 1966, compared to \$52,800 for all of 1965.)

NEW FISHERY PRODUCTS PLANNED

The Far Eastern fisheries export firm DALMOREPRODUKT will produce new specialized fishery products for domestic and

USSR (Contd.):

foreign markets this year. This decision was made after much planning and investment in technological research and manufacturing equipment. Among the new products: canned oysters; smoked mussels in oil packed in glass jars; canned squid in small containers; octopus in tomato sauce in small cans; canned trepang; cooked dried trepang in small plastic containers; canned shrimp; canned roe of sea urchins; medicinal preparations made of sea kale in small glass jars, and other products.

Many of the new products will be exported to Japan. Most seaweeds will be used in domestic agar-agar plants the Soviets are constructing.

The export firm also is sponsoring research conducted by the Pacific Fisheries Institute for Fisheries and Oceanography (PINRO). TINRO and the firm are administratively controlled by the state-owned Main Administration of Far Eastern Fisheries. In August 1966, this research centered on abalone resources near Sakhalin Island; in November 1966, on squid in the Gulf of Tartary between mainland USSR and Sakhalin. Research on seaweed resources was conducted throughout 1966.

* * *

DISCOVERS NEW SHRIMP RESOURCES

The research vessel "Kalmar" returned to Vladivostok from a 4-month exploratory trip in the northwestern Bering Sea where it discovered extensive shrimp resources in the Gulf of Anadyr. This is said to be one of the most significant discoveries by Soviet fishery scientists in recent years. Officials of the Far Eastern Fisheries Administration plan to send a shrimp fleet this year to explore the resource.

Another shrimp area was reportedly discovered by the research vessel "Osadkovo" off Northwest Africa. The Osadkovo left Kaliningrad in March 1966 with a party of 5 scientists of the ATLANTNIRO (Atlantic Scientific Research Institute for Marine Fisheries and Oceanography). Most of the research

was done in the Gulf of Guinea and in the Bight of Biafra (off Cameroon). The vessel returned in late August 1966.

* * *

RAIL MOVE AIDS KING CRAB TRANSPLANT PROGRAM

Soviet biologists have attempted to transplant Kamchatkan king crab (*Paralithodes camtschatica*) ever since 1930. They gave up in 1935. In 1960, they tried again and J. A. Misharev succeeded in bringing to Moscow alive, by air, 22 adult male crabs.

Soon, a research program was begun by several VNIRO (All-Union Scientific Fisheries Research Institute for Fisheries and Oceanography) laboratories to develop methods that would insure mass transplantation of king crab eggs, larvae, or adults. During October 1960-April 1961, over 8.2 million crab eggs were shipped overland from Vladivostok to Murmansk; only 1.5 million survived. In August 1961, almost 10,000 young crabs (under 1 year) were shipped; the survival rate is not known. Both attempts were not too successful.

A third attempt was made by air.

King crab specimens were collected at Petropavlovsk-Kamchatskii Laboratories from a local fishing Kolkhoz and transported to the Murmansk Marine Biological Station. The main Administration for Protection and Reproduction of Fishery Resources (Glavrybvod) was the principal Soviet agency concerned with the transport and acclimatization of crabs. Also participating in the studies of transplant results were VNIRO Laboratories in Moscow, PINRO in Murmansk and in Kamchatka, TINRO.

Barents Sea Offers Vast Potential

Air transport was costly and had adverse effect on survival rate. Glavrybvod began to look for other transportation means and settled for the old-fashioned Transsiberian Railroad. In November 1966, a specially equipped railroad car carried about 350 adult king crabs on the 10,000-mile journey from the Pacific to the Barents Sea. The crabs arrived in good condition.

USSR (Contd.):

The Soviets have great interest in the success of these experiments. In 1962, a VNIRO scientist (Iurii I. Orlov) calculated that the potential area of acclimatization of the Kamchatkan crab in the Barents Sea might be 4 times as large as is its present habitat along the Kamchatkan coast. Canned king crab exports are about one-fifth the value of all fishery exports; in 1965, they totaled 10.5 million rubles (\$11.5 million), three times the caviar exports.

* * *

HOLDS CONFERENCE ON MARINE MAMMALS

Representatives of fishery research institutes, the fishing industry, and conservation groups participated in the third All-Union Conference on Marine Mammals held in Vladivostok, November 1966. The conference was opened by the Director of Scientific Research of the USSR Ministry of Fisheries, I.P. Zaitsev.

The participants made the following recommendations: (1) Hunting for Pacific whales, walruses, and certain types of seals should be reduced because of diminishing stocks. (2) The potential of Antarctic seal resources should be studied (the Weddel Sea seals and the crab-eating seals in the Antarctic alone number 8 million to 9 million, according to Soviet scientists).

* * *

METEOROLOGISTS TO HELP FISHERMEN

Weather forecasting centers have been set up on all Soviet factoryships in the Murmansk fishing fleet (Soviet Northern Fisheries Administration). These centers, called "navigational and despatch bases," help fishing vessels avoid stormy areas and find calm seas.

At the time U. S. and USSR fishery officers were exchanged in the Northwest Atlantic--during the 1965 International Commission for the Northwest Atlantic Fisheries--only the factory flagship, with the Commander of the Fleet aboard, had meteorologists. They received their weather data from both Moscow and Washington weather stations. In addition, there was a rudimentary weather reporting

system from fishing vessels to flagship. Apparently this system now has been perfected--probably to cut down time lost by fishing vessels in bad weather.

The introduction of forecasting aboard the Murmansk fishing vessels is not unusual. Almost all advances and innovations are first tried in the Northern Fisheries Administration, the oldest and best organized of the 5 major Soviet Fisheries Administrations; eventually, improvements spread south and east.

* * *

CONDUCTS EXTENSIVE PACIFIC FISHERY RESEARCH

The fishery research vessel "Birokan" (SRT 4454) carried out a scientific expedition in the Bering Sea and waters off Aleutian Islands from December 1965-mid-October 1966. Its scientists studied the distribution and seasonal concentrations of Alaskan king crab on the Continental Shelf of the eastern Bering Sea and off Unimak Pass. During a previous cruise, October 1964-July 1965, the Birokan explored fishery and whale resources in the Eastern Pacific between Hawaii and Mexico. It discovered large schools of Pacific mackerel and sardines off Mexico.

In early November 1966, the research vessel "Lira" departed her Siberian home port for an extensive cruise off the Aleutian Islands to determine ocean perch stocks. The Soviet fleet has fished heavily for them in that area for several years; in 1965, 64,500 metric tons were caught.

The "Algama," a fishery research vessel of the Sakhalin Scientific Research Institute for Fisheries and Oceanography, returned to Iuzhno-Sakhalinsk in early December 1966 from a nearly year-long research cruise. The vessel discovered concentrations of commercial species in Tatarskii Strait, Sea of Japan, and on the wide Continental Shelf between the Sakhalin and Kuril Islands.

In late March 1966, commercial concentrations of walleyed pollock were discovered off the southwestern part of Sakhalin; for a short time, the Algama and the exploratory vessel of the Sakhalin Fisheries Administration cooperated in notifying Soviet commercial vessels of the new resource. In April, schools of "redfish" were discovered along

USSR (Contd.):

the Siberian coast, but not in commercial concentrations. By May, flounder concentrations were encountered between Cape Nelma and Cape Zolotoi below the Siberian City of Sovetskaia Gavan. Exploratory hauls yielded 3 to 4 metric tons of fish each. Other new resources found in the northwestern Sea of Japan off the Soviet Mainland were crabs, ling cod, and walleyed pollock; between Sakhalin and the southern Kurils, important concentrations of Pacific ocean perch were discovered.

In mid-December 1966, the fishery research vessel "Kalmar" departed for the same general areas to confirm Algama's findings and conduct more thorough research.

Early in December 1966, a new exploratory and fishery research vessel, the medium freezer trawler SRTM-8437, arrived at Nevelsk on Sakhalin Island. The vessel was constructed at Volgograd (formerly Stalingrad) Shipyards for the Sakhalin Fisheries Administration.



Norway

BUILDS SEVERAL LONG-RANGE FISHING VESSELS

Although Norwegian interest in purse seiners is at peak, considerable demand exists for distant-water freezer trawlers and long-liners.

A 265-ft. factory stern trawler for a Norwegian owner has been ordered from a Trondheim shipyard. It is scheduled to be delivered in September 1967. A shipyard at Aalesund is building a 217-ft. factory stern trawler scheduled for early 1967 delivery. Gross tonnage will be about 1,300 and main engine 2,140 horsepower. Planned for delivery in February 1967 is the 175-ft. freezer trawler "Ole Wirum" equipped with vertical plate freezers, giving 19- to 20-ton daily freezing capacity. A special plant is being built in Kristiansand to thaw and further process the catch of the Ole Wirum which will be frozen in large blocks.

The current trend in long-lining is for vessels operating year-round off Greenland

and for shark fishing in Atlantic waters. The vessels are combined "salters" and freezers. Many are converted whalers with shelter decks so that all fishing and processing operations take place under cover.

Long Liners Becoming Larger

Like purse seine owners, long-line owners are investing in bigger vessels. Conversion of several 158-ft. whalers was a big step forward. Now a 170-ft. vessel, formerly the "Star VI," built in 1948, has been rebuilt and renamed "Leiv Aarset". It is equipped with vertical plate freezers and a refrigerated hold for about 100 tons of frozen fillets or block-frozen mink fodder. The main emphasis will be on salted fish; 450-500 tons can be stored. The Leiv Aarset began operating off Greenland.

Joining the long-line fleet in February 1967 is the first vessel to be designed exclusively for Greenland fishing in several years and the biggest designed for long-lining. It costs about £150,000 (US\$420,000), has a main engine of 1,000 horsepower, and 2 continuous decks. Its main dimensions: length overall 160 ft.; breadth 29 ft.; depth to main deck 15 ft., and to shelter deck 22 ft. All accommodations are aft on the starboard side with access from a passageway of the port side. The long-line will be hauled from the main deck. The vessel's main task will be salting, but vertical plate freezers are fitted to handle small cod, haddock, ocean perch, and catfish. Total capacity of the holds is 21,500 cubic feet: about 75 percent is for salt fish, the remainder for frozen fillets.

Most long-line vessels do not have splitting or filleting machines. Mainly this is because the catch is brought aboard more slowly than in bottom trawling. However, owners are now considering installation of processing machinery with the eventual aim of having cutting crews. ("World Fishing," Nov. 1966, and "Dansk Fiskeritidene," Nov. 25, 1966.)

EXPORTS OF MOST FISHERY PRODUCTS UP IN FIRST 9 MONTHS OF 1966

In January-September 1966, Norwegian exports were up for frozen fillets, frozen herring, fish meal, and herring oil, while total shipments of canned fish were about the same as in the same period of 1965.

Norway (Contd.):

Frozen Fillets: U. S. imports of frozen fish fillets and blocks were over 5,200 metric tons (a gain of 16 percent), according to the U. S. Bureau of the Customs. European countries, however, continued to be the leading markets for Norwegian frozen fillets.

Canned Fish: "The Norwegian Canners Export Journal," October 1966, summarized the canning situation:

Following an above-average brisling fishing season, Norwegian exports of canned brisling were at a record level in the first 9 months of 1966. Larger shipments to England offset a decline in exports to the U. S. The Norwegian factories froze a quantity of brisling for canning after the October 15 close of the brisling fishing season. This reserve, combined with stocks on hand, were expected to provide adequate supplies to satisfy export demand.

**Sild and Shellfish Exports Down,
Herring Oil Up**

The decline in small sild exports was due partly to a shortage of supplies earlier in 1966. Heavy canning of small sild in the fall raised stocks to about 250,000 standard cases in late September 1966.

Shellfish exports were down due to sharp drop in shipments of canned shrimp.

Fish Meal and Oil: The U. S. became a significant buyer of Norwegian fish meal for the first time in recent years with imports in January-September 1966 of 13,700 metric tons (U. S. Bureau of Customs data). However, the leading market continues to be the United Kingdom.

The sharp rise in exports of crude herring oil reflects the increased output of the reduction plants. With record herring catches, 1966 production of 200,000 tons of fish oil and 400,000 tons of fish meal were forecast. ("Fiskets Gang," Oct. 27 and 28, 1966.)

**GOOD MARKET FOR FISH MEAL AND
OIL IN DECEMBER 1966 REPORTED**

Most of Norway's fish meal and oil has been sold, reported Norsildmel, the centralized sales organization for the fish reduction plants. The record stocks of fish meal (230,000 metric tons) and oil (120,000 tons) at the beginning of November 1966 will have been shipped to customers at home and abroad before the end of March 1967. Substantial future sales of the 1967 production of fish meal also have been concluded.

The Norwegian ban on fishing for the meal and oil industry was lifted at the end of 1966. (U. S. Embassy, Oslo, Dec. 11, 1966.)

**FIRM TO MAKE HIGH-PROTEIN
FISH MEAL**

A Norwegian plant is scheduled to start producing high-protein herring meal in May 1967. Its annual output will be 12,000 metric tons. The producers claim their product will contain less than 1 percent fat and 80-83 percent protein, compared to 70-75 in regular herring meal.

Petroleum solvents will be used to draw the fat out of the meal, but none of them will remain in the finished product. The estimated price will be higher than the price for regular meal. It is claimed, too, that the high-protein meal will be a good mink food--and that it can be fed to pigs right up to the day they go to the slaughterhouse, without affecting the taste of pork. (Export Council of Norway, Dec. 1966.)

Norwegian Exports of Selected Fishery Products,
January-September 1965-1966

Product	Jan. -Sept.	
	1966	1965
	... (Metric Tons) ...	
Frozen fillets:		
Haddock	10,912	7,336
Cod	20,792	20,371
Coalfish	13,512	14,509
Herring	8,207	3,252
Other	4,674	6,447
Total frozen fillets	58,097	51,915
Frozen herring	13,552	9,932
Canned fishery products:		
Brisling	5,619	4,947
Small sild sardines	8,784	9,833
Kippers	2,429	2,560
Shellfish	568	922
Other	3,452	2,871
Total canned fish	20,852	21,133
Fish meal	183,121	170,279
Herring oil, crude	49,195	3,611

Norway (Contd.):

FISH MEAL AND OIL SUPPLIES WERE HIGH IN FIRST 10 MONTHS OF 1966

Due to heavy production of fish meal and oil in the first 10 months of 1966, Norway banned industrial fishing from November 5 to December 31, 1966. The ban reflected the oversupply in the international fish meal market. Norwegian stocks of herring meal in early November 1966 were 200,000 metric tons, about twice November 1965 stocks.

Record catches resulted from exceptionally rich occurrences of herring, favorable fishing conditions, and a purse-seine fleet almost trebled in catching capacity during 1966. Total deliveries to fish reduction plants for first 10 months exceeded 20 million hectoliters, compared with about 16 million hectoliters for all of 1965. Official estimates of 1966 fish meal production were about 400,000 metric tons (309,000 tons in 1965). Production of fish oil was expected to exceed 200,000 tons (167,000 tons in 1965).

Exvessel Prices Were High

Despite declining export prices for herring meal, exvessel prices in Norway were maintained at very high levels during 1966. This was made possible by transfers of more than 100 million kroner (US\$14 million) from the Herring Price Regulation Fund (Sildefondet). The Fund stood at 138 million kroner (\$19 million) prior to the first price reduction in summer 1966 for fish delivered to reduction plants.

The ban on fishing for the fish meal and oil industry was widely accepted in fishing circles as necessary to bridge the gap between production and sales of fish meal. (U. S. Embassy, Oslo, Nov. 13, 1966.)

Note: One hectoliter equals 220.46 lbs. or 26.4 gals.



Iceland

EXPORTS OF FISH MEAL AND OIL WERE UP, FILLETS AND STOCKFISH DOWN

During January-July 1966, Iceland's exports of fish meal and oil increased sharply over the 1965 period, according to the periodical "Hagtidindi," August 1966. But ex-

Exports of Selected Fishery Products, January-July 1965-1966

Product	Jan.-July 1966			Jan.-July 1965		
	Qty.	Value f.o.b.		Qty.	Value f.o.b.	
	Metric Tons	1,000 Kr.	US\$ 1,000	Metric Tons	1,000 Kr.	US\$ 1,000
Salted herring	12,129	150,481	3,495	10,546	114,232	2,653
Other salted fish	24,001	460,264	10,689	26,133	442,480	10,276
Stockfish	3,006	95,403	2,216	6,216	180,448	4,191
Herring, frozen	13,444	87,061	2,022	15,803	100,271	2,329
Fish fillets, frozen	23,638	624,727	14,508	29,885	680,695	15,808
Shrimp & lobster, frozen	659	84,498	1,962	311	37,249	865
Fish and whale oil	54,734	438,361	10,180	43,554	368,074	8,548
Fish meal	81,284	616,930	14,327	64,806	450,056	10,452

Note: Values converted at rate of 1 krona equal 2.32 U. S. cents.

ports of frozen fish fillets and stockfish decreased in the first 7 months of 1966.



Denmark

MODERN PURSE-SEINE VESSEL ACQUIRED

The "Caroline Musholm," the first Danish fishing vessel specifically designed to use modern purse-seine gear, was scheduled to be completed in Norway in mid-December 1966. The vessel will carry a 12- to 15-man crew and work the Greenland and Faroese fisheries. Displacing 450 tons, it is nearly 43 meters (141 feet) long, and is propelled by an 800-horsepower engine. It is the first Danish fishing vessel to employ side-thrust propellers fore and aft. Its fish pump can empty a 300-ton catch within an hour. ("Vestkysten," Dec. 9, 1966.)



Greenland

FISHERIES PROCESSING PLANT IS BEING BUILT

A private company is constructing a processing plant at Jacobshavn. The plant will cost about 1.5 million Danish kroner (US\$217,000) and process shrimp, salmon, and halibut. The primary emphasis will be on freezing shrimp. The plant will employ 60-70 persons when it begins operations after October 1967. ("Berlingske Tidende," Dec. 12, 1966.)



France

PLANS TO ASSIST FISHING INDUSTRY

Programs authorized in 1967 to subsidize construction and modernization of fishing vessels will go from 3.5 million to 8.7 million francs (US\$707,000 to \$1,757,400). For other aid and supports, 2.9 million will be increased to 7.12 million francs (US\$385,800 to \$1,438,200). The aid will be directed towards research and training activities, investment, and market organization.

The Government is asking industry to make a special effort to finance developments that will spur the organization of markets. Consolidation of firms is encouraged to meet competition from other European Economic Community (EEC) countries. Those unable to consolidate or too small to compete will be assisted to leave the industry.

Funds for Laboratories and Fleet

The funds allotted for the Fisheries Institute will complete the laboratories at Sete and La Trinite-sur-Mer, and construction of one at Nantes. The operating funds permit recruitment of technicians. Two training vessels will be built and the training schools fully equipped. Greater efforts will be made in social welfare.

To modernize fleet, the Government plans to increase aid to fishing and vessel industries. Probably, assistance will be based on vessel size. The larger ones, capable of remaining or becoming competitive in the EEC, will receive subsidies up to 15 percent. Also, they will benefit from long-term credits and tax reduction. But Government aid will not extend beyond 1967. For small craft fishing, aid will augment loan facilities. The small-scale fishermen will benefit from relocation plan funds. ("Maree de France," Dec. 1966.)

TUNA LANDINGS WERE 10% OF FISH PRODUCTION

The French tuna fishery produced about 42,000 metric tons of tuna in 1965. This accounted for 10 percent of France's total fish production and 14 percent of the marine fish production. ("Revue Generale du Froid," August 1966.)



German Federal Republic

IMPORTS 80% OF CANNED TUNA IN OIL FROM JAPAN

West Germany buys from Japan about 80 percent of her imports of canned tuna in oil. In 1965, she imported 14,271 metric tons: 11,550 tons from Japan, 1,816 tons from Yugoslavia, and 597 tons from Peru, and the remainder from another source.

Imports during first-half 1966 were 5,777 tons: 4,331 tons from Japan, 967 tons from Peru, and 318 tons from Yugoslavia, and the remainder from another source. The sharp decline from Yugoslavia was attributed to that country's almost complete suspension of production due to rising costs of frozen tuna from Japan. At over US\$500 a metric ton, they made profitable operations impossible. ("Kansume Nippo," Nov. 15, 1966.)



Italy

FROZEN TUNA IMPORT QUOTA INCREASED 5,000 TONS

According to the Japanese Embassy in Rome, the European Common Market agreed to let Italy increase the quantity of frozen tuna she could import from nonmember countries under the lower tariff of 0.5-percent ad valorem from 40,000 to 45,000 metric tons for the current fiscal year.

Italy had requested a 10,000-ton-quota increase because Common Market nations could not supply adequately growing domestic demand. ("Suisancho Nippo," Dec. 26, 1966.)



United Kingdom

FISHERY LOAN INTEREST RATES ANNOUNCED

The British White Fish Authority announced that its rates of interest on loans made from October 22, 1966, would be:

Fishing vessels, new engines, nets, and gear: on loans for not more than 5 years $7\frac{5}{8}$ percent, decrease $\frac{1}{8}$ percent; on loans for more than 5 years but not more than 10 years $7\frac{1}{2}$ percent, decrease $\frac{1}{4}$ percent; on loans for

United Kingdom (Contd.):

more than 10 years but not more than 15 years $7\frac{1}{2}$ percent, decrease $\frac{1}{8}$ percent; on loans for more than 15 years but not more than 20 years $7\frac{1}{4}$ percent, decrease $\frac{1}{8}$ percent.

The rates for loans to processing plants--for not over 20 years--remain unchanged at $7\frac{1}{4}$ percent. ("Fish Trades Gazette," Nov. 5, 1966.)



Greece

LANDINGS ROSE IN FIRST 9 MONTHS OF 1966

The Atlantic freezer trawler fleet landed 22,547 metric tons of frozen fish in the first 9 months of 1966, compared to 18,818 tons in the same period of 1965. The increase was partly due to unusually heavy arrivals in September 1966, which raised stocks of frozen fish in Greece to about 7,000 tons. Wholesale frozen fish prices showed some decline in September; they stabilized at about 9 to 10 drachmas a kilo (13.7 to 15 U. S. cents a pound).

Greek trawlers have been moving farther south along the African coast because of declining catches off more northern areas of Africa. The area around 10° N. latitude has become an important fishing ground for Greek trawlers. Two trawlers reported plans to transship catches either from Las Palmas or directly from transport vessels on fishing grounds.

Several are fishing for shrimp in the Persian Gulf. ("Alieia," Oct. 1966.)



Romania

FISHES OFF AFRICA

The Romanian freezer stern trawler "Galati" left home port for her 6th fishing trip to the Cape Verde Plateau off Africa's northwestern coasts (between the Canary Islands and Dakar). Previously, the Galati fished on Georges Bank in the Northwest Atlantic.

A second stern trawler, the "Constanta," will join the Galati in the African fishing grounds after its overhauling in a Rotterdam shipyard is completed.



Bulgaria

HAS AMBITIOUS 5-YEAR PLAN

The Bulgarian 5-Year Plan (1966-1970) provides a 500-percent increase over the 1965 fish landings of 17,300 metric tons. Most of the 87,000 tons planned to be landed in 1970 will come from Bulgarian high-seas operations, conducted mainly in the Atlantic off South-West Africa. Bulgaria has 4 or 5 large stern trawlers (3,200 gross tons each), but the USSR is committed to sell her 20 such trawlers by 1970. ("Rabotnicheskoe Dele," Nov. 27, 1966.)



Poland

WILL PRODUCE FISH PROTEIN CONCENTRATE

The scientists of the Polish Sea Fisheries Institute, Swinovjskie Branch, have produced several kilograms of odorless and tasteless fish protein concentrate. Commercial production on a small scale is expected to begin this year. ("Polish Maritime News, No. 97, Sept. 1966.)

FIRST FISHERY FACTORY-MOTHERSHIP SAILS FOR NORTH ATLANTIC

The M/S "Gryf Pomorski" (Pomeranian Griffin) sailed in January from Szczecin for the Atlantic fishing grounds between Labrador and Georges Bank. Its launching introduced the "factory-mothership" concept to the Polish deep-sea fishing fleet. It represents a significant advance for the deep-sea fishing industry. While Polish vessels are not newcomers to the northwest Atlantic fishing grounds, only in recent years has the area assumed real importance. In 1960, for example, Poland had only one factory trawler in the northwest Atlantic; annual catches were under 3,000 metric tons. By

Poland (Contd.):

1965, the catches had increased to 56,000 tons.

The vessel was built at the Gdansk shipyards for the Dalekomorskie Bazy Rybackie (Overseas Fishing Bases) of Szczecin. It has these features: shelterdeck; gross weight of 13,000 tons and dead weight of 9,200 tons; length: 165.5 meters (542 feet), breadth: 21.3 meters (70 feet); speed: about 15 knots; and her 5 holds have total capacity of 10,130 cubic meters (357,890 cubic feet). Four holds are immediately refrigerated to -25 degrees C. (-13° F.) at an external temperature of +30° C. (80° F.). The fifth hold will be used for storage of fish meal; the ship will produce daily 20 metric tons of meal, 20 tons of ice, and 48 tons of water.

9 Trawlers Accompany Her

Gryf Pomorski is accompanied by 9 trawlers able to unload 150-200 tons of fish every 24 hours. When it returns to port in early March, it will carry about 4,800 tons of frozen fish, 800 tons of fish meal, and 200 tons of oil. Of the 257-person crew, 136 are producing the products listed. Present plans call for four or five 75-day trips a year.

In addition processing and storage functions, Gryf Pomorski will provide social and cultural amenities for her own and the trawler crews. It is fitted with movie hall, reading room, hospital, laundry, and barber shop.

The Gdansk shipyard will complete in late 1967 a second ship of this type. A third is due before the end of 1970.



Czechoslovakia

TO IMPORT BRITISH FROZEN FISH

State-owned import firms have contracted to buy US\$840,000 worth of frozen fish a year from the British frozen seafood consortium. The fish will be shipped from the fishing ports of Grimsby and Hull via Hamburg. ("Fishing News," Dec. 9, 1966.)



Ireland

EXTENDS FISHERIES ZONE TO 12 MILES

The law extending Ireland's fishery limits from 6 to 12 nautical miles has become effective. The Irish will recognize traditional West European fisheries (France, Belgium, Netherlands, Spain, and West Germany) in the outer 6-mile zone, but those nations will not be allowed to open up new fishing areas or change the traditional type of fishing.

Other countries that used to fish within the 12-mile zone, including the Soviet Union and Poland, will be barred there in the future. ("New York Times," Jan. 5, 1967.)

BCF EXPERTS TO AID IRISH FISHERIES

John B. Glude, Deputy Regional Director of BCF's Seattle office, and John Peters, fisheries technologist of BCF's Gloucester (Mass.) laboratory, left for Dublin in mid-February to assist the Irish Government in setting up a program to improve the fishing industry.

They will help Irish officials implement recommendations of the U. S. survey team in a 1964 report on Ireland's fishing problems. Glude, a leader of that team, said the study followed a request by the then Irish Prime Minister, Sean Lemass, to the late President Kennedy.

According to Glude, the Irish Government is particularly interested in a three-phase program: Improvement of boats and gear; Development of shellfish resources, such as oysters, mussels, clams and lobsters; and Fish quality control, which involves improvements in care and handling of fish after they are caught.

"Ireland's fishing industry is relatively small, but the potential is there for a sizeable increase," Glude stated. Ireland exports some fish, especially to England and France, and there is considerable opportunity to expand both domestic consumption and the export business. Glude noted that Ireland has much to learn about proper care of fresh-caught fish.

"For example, it is common practice not to ice fish after they are caught because many Irish consumers believe that fish must not be fresh if it has to be placed on ice," he said.

Glude and Peters expect to be in Ireland 4-6 months. The Irish Government is paying their expenses.



ASIA

Japan

CURBS PORT CALLS BY FOREIGN VESSELS

Starting December 12, 1966, Japan began to implement a new ordinance affecting foreign fishing off her coast and fish landings in her ports:

- **Prohibition of Fishing:** Foreign nationals and corporations are not permitted to fish within territorial waters. Japan presently adheres to 3-mile territorial sea limit.

- **Restrictions on Fish Landings:** Foreign nationals are not permitted to land their catches or processed fishery products in Japan--except: (1) shipments from foreign countries accompanied by certificates of shipment; (2) catches of Japanese fishing vessels landed legally by foreign residents in Japan; (3) imports authorized under Import Trade Control Ordinance; and (4) fish landings approved by the Minister of Agriculture and Forestry.

- **Halt Orders to Vessels:** The Minister of Agriculture and Forestry is authorized to issue halt orders to vessels observed violating provisions of this ordinance.

The ordinance also contains penalties: Maximum of two years in prison, fine not exceeding 50,000 yen (US\$139), and confiscation of vessel and fishing gear. ("Suisan Keizai Shimbun", Dec. 7, 1966.)

HAS \$6.4 MILLION OVERSEAS FISHERY INVESTMENTS

Japanese capital in overseas fishery ventures, as of October 1, 1966, totaled about US\$6.4 million--0.8 percent of total Japanese investments abroad--invested in 32 corporations in 28 countries. This was disclosed in late 1966 by the Japanese Fisheries Agency in its report: "Present State of Investments in Overseas Cooperative Fishery Ventures."

Investments in Central and South America (10 countries) led with \$2.85 million in 11 companies, followed by southeast Asia (9 countries) with \$1.77 million in 11 companies,

Africa (4 countries) with \$344,000 in 4 companies, and Near East, Europe, and North America (5 countries) with \$1.4 million in 6 companies. Japan's average capital outlay of \$200,000 per invested company represents an investment ratio of over 50 percent to the average paid-up capital of about \$361,000 per company.

Of the 32 corporations, 8 are engaged in land-based cold storage operations (they lead all others in value of investment); 10 in bottom trawling; 8 in tuna fishing; and one in whaling. Those firms operate 86 vessels: 58 trawlers, 17 tuna vessels, 6 whaling vessels, and 5 "other."

Overall Landings Trending Downward

Fish production by the joint companies (based on reports from 11) in 1965 totaled 22,000 metric tons: 14,300 tons of bottom-fish; 5,500 tons of tuna and tunalike fish; and 2,200 tons of shrimp. About 1,000 whales were landed. While shrimp and whale production have gradually increased, overall fish landings have been trending downward since 1964 due to the leveling off of the trawl catches and a decline in tuna production.

Japanese employees assigned to overseas companies number slightly over 600, about 20 percent of the estimated 3,000 employed by those firms. Of the 25 companies reporting on their 1965 business conditions, 7 showed profits, 11 losses, and 7 were either not yet operating, idle, or in unknown financial position. ("Suisan Keizai Shimbun," Dec. 12, 1966, and other sources.)

GRANTS \$9 MILLION TO S. KOREA FOR FISHERIES DEVELOPMENT

In December 1966, Japan and S. Korea agreed that Japanese grants to S. Korea will include US\$2,615,000 to promote fishing and \$6,473,500 to introduce, construct, or remodel fishing vessels--a total of \$9,088,500. This is the second series of grants under the Japan-South Korean Fisheries Cooperative Program. The first series totaled \$13,530,000. No money can be spent for vessels or facilities to be used in the North Pacific salmon fisheries.

Japan (Contd.):

The grants are part of Category 1 of the Japan-Korean Settlement Agreement. Under the grant program, \$40 million is for fisheries. To date, \$22,618,500 has been allocated--about half. ("Suisan Tsushin," Dec. 1, 1966.)

* * *

PROFITS RISE FOR MEDIUM AND SMALL FISHERY FIRMS

A summary of the latest economic report of the Ministry of Agriculture and Forestry's Statistics and Survey Division appeared recently in a periodical. Titled "Economics of Medium and Small Fishery Establishments for 1965," it points out:

(1) The gross receipts of small and medium fishery enterprises increased for all sizes of vessels. They were especially marked for the 50- to 100-, 100- to 200-, and 200- to 500-ton vessels.

(2) Expenses also increased for all sizes, but the rate of increase for gross receipts exceeded the increase in expenses. So, there was more profit.

(3) The greatest cost increase was for labor. This report is in line with others expressing industry concern over the increasing cost of labor.

Depreciation increased slightly for the 30- to 50- and 50- to 100-ton categories and decreased in the others. Purchase of fixed assets for vessels decreased in 1965. This is viewed with some alarm since it means a stagnancy in equipment investment and will lead to inefficient operation. The decrease in equipment investment is a new aspect which could affect Japan's future position among fishing nations. ("Suisan Keizai Shimbun," Dec. 2, 1966.)

* * *

ALBACORE PRICE STABILIZATION IS SUCCESSFUL

The first year's operation of the Japan Federation of Tuna Fishermen's Cooperative Associations' (NIKKATSUREN) 3-year albacore price stabilization program, launched in October 1965, is showing good results. The program was designed to promote canned

albacore consumption in Japan and to purchase and store summer albacore landings to adjust supply. It has contributed much toward keeping prices relatively high. Under the plan, when the summer pole-caught albacore prices drop below exvessel 150 yen a kilogram (US\$378 a short ton), the organization buys and stores the catch. The basic price of 150 yen a kilogram was based on production costs.

The 1966 price increase was due primarily to reduced supply; albacore production, including domestic landings and transshipments, during September 1965-August 1966 totaled about 110,000 metric tons, down 30,000 tons, or 22 percent, from the preceding 12 months. The program helped stimulate the upward trend. This resulted in rise of domestic exvessel albacore prices to an average of 160.25 yen a kilogram (\$403 a short ton). Thus, during the program's first year, there was no need to adjust the supply.

The Program's Rationale

This is the program's premise: If prices of albacore, which comprise about one-fifth of Japan's total tuna landings, could be maintained at a minimum level, particularly in the summer, when large quantities are harvested during a short period and exported mainly to the United States--it would also stabilize prices of other tunas. Thus, the Federation adopted the policy of promoting domestic demand to divert more supply to it, and also to store summer landings to counteract price decline. The program was established with a budget of 38 million yen (\$105,555). This will be met by assessing vessel owners 80 sen per kilogram (\$2 per short ton) for ship-frozen tuna landed in Japan, and 70 sen per kilogram (\$1.80 per short ton) for fresh tuna landings. ("Minato Shimbun," Nov. 7, 1966.)

* * *

UNIFIED TUNA FISHERY ADMINISTRATION UNDER STUDY

The Japanese Fisheries Agency is trying to improve management of the tuna fishing industry. It is considering means of consolidating administration of the coastal, distant-water, portable-boat-carrying mothership, and regular mothership fisheries, which presently are directed separately.

Japan (Contd.):

Under study is a formula permitting vessel transfers from one fishery to another at a set ratio--e.g., from the presently depressed mothership fishery to the distant-water fishery--thereby helping distressed vessel owners overcome management difficulties. The consolidation also would correct the present imbalance in vessel operations of the different tuna fisheries, eliminate operational violations and unsafe fishing practices, and protect the resources from overfishing. ("Shin Suisan Shimbun," Oct. 31, 1966.)

* * *

APPROVES ATLANTIC TUNA
TRANSHIPMENTS TO SPAIN

The Japanese Fisheries Agency, requested by the Japan Frozen Tuna Producers Association, has agreed to authorize a 6,000-ton Atlantic transshipment quota for frozen tuna exports to Spain for the fiscal year ending March 31, 1967. The Agency had prohibited such transshipments for fear that Japanese tuna would be packed for export to the United States and compete with Japanese canned tuna. However, the growing tuna demand within Spain during the past three years, revealed by marketing studies, led the Agency to believe that the Japanese supply would not be transshipped. Presently, no restrictions are imposed on direct tuna shipments from Japan because their higher cost would not make it profitable for Spain to pack them for export. ("Katsuo-maguro Tsushin," Oct. 28, 1966.)

* * *

TUNA MOTHERSHIP FISHERY TO TRY
PLASTIC PORTABLE BOATS

The Japanese Fisheries Agency's Fishing Vessel Research Laboratory will construct a 5-meter (16-foot) long, reinforced plastic portable fishing boat for use by tuna motherships. It is scheduled to be completed by March 1967. The craft is one of three types the laboratory will design and test under a 3-year program to develop suitable plastic boats for the portable-boat-carrying tuna mothership fishery. ("Suisan Keizai Shimbun," Nov. 11, 1966.)

* * *

TRAWLER TO EXPLORE
OFF U. S. EAST COAST

The Japanese Overseas Trawlers Association, whose members agreed to explore jointly the western Atlantic Ocean to develop new trawling grounds, will conduct initial operations off Florida's east coast. The Association was selecting a 1,000-ton class vessel capable of trawling at depths of 600-700 meters. It was scheduled to sail by the end of 1966 on a 40-day cruise.

A maximum budget of 80 million yen (US\$222,000) has been allocated for this expedition. The Association's trawl fishery development plan includes exploration of waters along the North and South American continents extending from Newfoundland to Patagonia, Argentina. If initial explorations off Florida proceed smoothly, the Association plans to expand the scope of operations progressively. ("Nihon Suisan Shimbun," Oct. 28, 1966.)

* * *

CONSULTANT SERVICE EVOKES
WIDE INTEREST ABROAD

The Fisheries Section established by the Japanese Society of Engineers in spring 1966 to provide consulting service to the fishing industry has aroused considerable interest abroad. It has received numerous inquiries for technical assistance and cooperation from foreign countries, including the Philippines, Denmark, Canada, Turkey, Uganda, and Nepal, and from the United Nations Development Program and the FAO Research Institute in Ecuador. To respond to the growing number of inquiries, the Society will form a corporation, named the Technical Consultants, Inc. The corporation will provide on a fee basis an information service, conduct surveys, and send experts abroad. ("Nihon Suisan Shimbun," Oct. 26, and "Suisan Keizai Shimbun," Oct. 21, 1966.)

* * *

START MADE ON LARGE
GOVERNMENT RESEARCH VESSEL

The construction of a 3,150-gross-ton research vessel, largest of its kind in Japan, began October 24, 1966, in Shimizu. It is being built for the Japanese Fisheries Agency at a cost of almost US\$5.6 million and will

Japan (Contd.):

be completed this summer. The vessel was designed to withstand operations in the polar regions. It will be equipped with the latest fishing gear and modern scientific instruments to measure oceanographic and meteorologic phenomena. Specifications: total length 82 meters (269 feet); beam 15 meters (49.2 feet); draft 9.2 meters (30.2 feet); maximum speed 16.5 knots; cruising speed 13.5 knots. ("Suisan Keizai Shimbun," Oct. 28, 1966.)

HAKE IS GAINING
CONSUMER ACCEPTANCE

Hake (merluza) is gaining wider consumer acceptance in Japan as a result of the vigorous promotional campaign being conducted by the firm that first introduced it into Japan a few years ago. To overcome slow sales, the firm began promoting hake aggressively in August 1966 by means of television commercials, cooking demonstrations, leaflets, and in-store advertising. Sales during August-October 1966 totaled over 4,000 tons. The firm's Atlantic trawlers are harvesting the fish in large quantities off northwest and south Africa. ("Nihon Suisan Shimbun," Dec. 5, 1966.)

TRAWLER EXPLORES FISHERIES
OFF U. S. PACIFIC COAST

The 550-ton trawler "Mogami Maru," which returned to Japan in November 1966 after experimental hake operations off the west coast of the U. S. and Canada, left Tokyo December 1 on her second trip to the eastern Pacific. She was scheduled to work south from the previous area of operation (45°-50° N. latitudes) toward San Diego, Calif., and fish for 85-90 days. In previous operations off Vancouver, the Mogami Maru caught a daily average 25-30 metric tons of rockfish. ("Minato Shimbun," Dec. 1, 1966.)

ATLANTIC TUNA LONG-LINERS
REPORT GOOD FISHING

Japanese tuna long-liners operating out of Sao Vicente, Cape Verde Island, reported

good fishing in mid-December 1966. Catches amounted to 4-5 metric tons per vessel a day. Presently 13 Japanese tuna vessels are based there and 4 more are scheduled to join the fleet soon. Tuna delivery prices at the Cape Verde base were US\$480 a short ton for round albacore and \$460 a ton for gilled and gutted yellowfin. ("Suisancho Nippo," Dec. 14, 1966.)

PURSE SEINER CONTINUES TRIAL
TUNA FISHING IN SOUTH PACIFIC

The 210-gross-ton purse seiner "Taikei Maru No. 23," which conducted experimental tuna fishing in the South Pacific in 1966 with good results, departed Ishinomaki in northern Japan November 28, 1966, on her second trip.

The seiner, equipped with 2 power blocks, would fish for skipjack and yellowfin tuna in waters off the Mariana, Caroline, and Solomon Islands until early April 1967, then head north seeking bluefin off the Ogasawara Islands for one month en route home. It is reported that 5 other Japanese purse seiners, including the fishing firm Taiyo's 300-ton vessel under construction, are planning to conduct experimental fishing in the South Pacific in 1967. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

PURSE SEINING IS GOOD
OFF NEW GUINEA

The 253-gross-ton purse seiner "Nissho Maru," which began fishing in the South Pacific north of New Guinea in November 1966, had caught 45 metric tons of fish in four sets by early December. Her catch was mainly skipjack tuna and some yellowfin. ("Katsuo-maguro Tsushin," Dec. 7, 1966.)

ENDS TUNA MOTHERSHIP OPERATIONS
IN SOUTH PACIFIC

The fishing firm Taiyo discontinued its mothership-type tuna operations in the South Pacific until 1970 because it had difficulty contracting catcher vessels to fish for the mothership. About 45 catcher vessels of at least 100 gross tons are required to conduct the operations. Due to improved tuna market

Japan (Contd.):

conditions, vessel owners now operating profitably by themselves prefer not to charter their vessels to mothership firms. Taiyo conducted two mothership operations in the South Pacific in 1964, one in 1965, but in 1966 could not send an expedition because of the catcher-vessel problem. ("Minato Shimbun," Nov. 27, 1966, and other sources.)

* * *

COASTAL WHALE KILL WAS 2,348

As of November 30, 1966, the 4 fishery firms conducting coastal whaling had produced this record:

Company	Finback	Sei (No. of Whales)	Sperm	Total
Taiyo	59	123	412	594
Nihon Suisan	1	83	926	1,010
Nitto Hoge	18	48	337	403
Kinkai Hoge	26	57	258	341
Total	104	311	1,933	2,348

Compared with the 1965 kill, Taiyo showed a slight decrease, Nitto and Kinkai about the same, and Nihon Suisan about 300 more whales. The season closed on December 15. Because of sea conditions, little change was expected in the catch data.

Soviets Enter Fishery

A Japanese periodical reported in early December on the effect of the Soviet whale fleets on the Japanese coastal whaling installations. The first Soviet whaling fleet was sighted by a Japanese vessel November 23, 1966, off Kinkazen (39°29' N. and 144°16' E.). The fleet consisted of 1 mothership (20,000-ton class) and 2 catcher boats. The 4 Japanese firms operating coastal stations are expressing alarm and anticipate additional fleets in the near future.

The companies are much concerned about the future of the resource. They are studying the possible ways to deal with the Soviet entry--an event that will decrease the number of whales coming inshore to the Japanese. One way would be to convert the land-based fishery to a mothership operation: to take the whales offshore in the area fished by the USSR. ("Suisan Tsushin," Dec. 2, and "Suisan Keizai Shimbun," Dec. 1, 1966.)

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LICENSES ONLY ONE FIRM FOR
1967 ARCTIC SALMON OPERATION

The Japanese Fisheries Agency, which has been studying a licensing policy for the 1967 salmon fishing in the Arctic Ocean, is permitting only one firm to operate there. The operation again is licensed on a trial basis. The firm selected is the one that sent the "Darin Maru No. 8" to the Chukchi Sea in July 1966.

The vessel harvested about 85 metric tons of chum salmon between 66°-68° N. latitudes. Some observers deduced from this that the area could become a new fishing ground. The Fisheries Agency received license applications from major operators involving 21 salmon vessels. In selecting only one firm, the Agency reasoned: (1) salmon resources in the Arctic Ocean are not very abundant; (2) while the area lies outside the International North Pacific Treaty waters, increased operations would irritate the U. S. and the USSR.

Some industry members believe that industry alone should not conduct the operations--that the Government should guide and supervise the operations, and confirm and publish the results. These members believe, too, that if the Government permits the operation of four 200-gross-ton vessels (their combined catch would not be over 400 metric tons), it would not hurt the resources, irritate other nations, and would help resource assessment. ("Suisan Tsushin," Dec. 9, 1966, and "Suisan Keizai Shimbun," Dec. 8, 1966.)

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SWORDFISH EXPORTS TO
U. S. AND CANADA ARE STEADY

Frozen swordfish validated for export to the United States and Canada during April-September 1966 totaled 2,301.9 short tons valued at US\$1,751,649. During the same period in 1965, 2,285.3 tons worth \$1,684,299 were exported. ("Suisan Tsushin," Oct. 31, 1966.)

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FROZEN TUNA EXPORT VALIDATIONS
WERE STEADY IN 1966 PERIOD

Frozen and fresh tuna validated for export during April-October 1966 were virtually the same as in the 1965 period:

Japan (Contd.):

Frozen and Fresh Tuna Exports, Apr.-Oct. 1966 with Comparisons				
	U.S.- Canada	Exports to:		Total
		Overseas Bases	Other Countries	
Tuna:	.. (Short Tons) 1/ (Metric Tons) ..	
Albacore 2/	29,858	7,637	2,846	36,861
Yellowfin 3/	25,711	4,805	23,589	51,364
Big-eye 3/	1,677	818	6,704	8,968
Skipjack 2/	5,089	9	1,479	6,104
Bluefin 3/	-	-	1,318	1,318
Tuna loins	3,398	-	-	3,083
Apr.-Oct. 1966	65,733	13,369	35,936	107,698
Apr.-Oct. 1965	75,298	7,036	34,139	108,832

Frozen and Fresh Tuna Export Validations, October 1966				
	Exports to:			Total
	U.S.- Canada	Overseas Bases	Other Countries	
	.. (Short Tons) <u>1</u> (Metric Tons) <u>2</u> ..	
Tuna:				
Albacore <u>2</u> /	3,698.5	573.0	656.0	4,531.1
Yellowfin <u>3</u> /	3,548.8	871.5	5,515.3	9,526.3
Big-eye <u>3</u> /	142.1	-	542.6	671.5
Skipjack <u>2</u> /	332.6	-	475.0	776.7
Tuna loins	525.0	-	261.9	738.2
Oct. 1966	8,248.0	1,444.5	7,450.8	16,243.8
Oct. 1965	8,928.0	1,747.6	2,013.5	11,698.5

1/To convert short ton to metric ton, multiply by 0.9072.
2/Round fish.
3/Gilled and gutted, dressed, and fillets.

("Suisan Tsushin," Nov. 25, 1966, and other sources.)

ALBACORE EXPORT PRICE DECLINES

Japanese frozen albacore export prices for direct shipment to the U. S. have been weakening since mid-December 1966 because of lack of buying interest by U. S. packers and good catches in the Indian and Atlantic Oceans. Frozen round albacore of over 30 pounds which, in early December 1966, sold for US\$550 per short ton c. & f. U. S. west coast delivery, dropped by \$5 in mid-December and then declined further by \$15-20 a ton. Some Japanese observers view this price weakening as a temporary condition resulting from the completion by U. S. packers of their first round of albacore buying for Lent. ("Suisan Tsushin" Dec. 21, 1966.)

70 TUNA LONG-LINERS IN ATLANTIC

About 70 Japanese tuna long-liners were operating in the Atlantic Ocean in mid-December 1966. Most were fishing in the western Atlantic off Brazil, taking mostly albacore tuna, with landings averaging 2-3 tons a vessel a day. Other vessels were operating in the Caribbean Sea, North Atlantic off the Azores, and the central Atlantic Ocean.

Landings in the Caribbean were averaging 3-4 tons a vessel a day, with catch composition gradually shifting from yellowfin to albacore. Fishing off the Azores was good, with daily catch per vessel averaging 4-5 tons; catches consisted mostly of albacore mixed with big-eyed. In the central Atlantic, where yellowfin and big-eyed were being taken, fishing was slow. Since late November 1966, catches in the Atlantic gradually trended toward albacore. ("Suisan Tsushin," Dec. 16, 1966.)

CANNED TUNA SALES IN FIRST 10 MONTHS 1966 ABOVE 1965

The Japan Tuna Packers Association offered for November 1966 sale 300,000 cases of canned tuna in brine for export to the U.S. This concluded the canned tuna in brine sales to exporters for the business year ended November 30, 1966. Sales through October 1966 totaled 2,060,000 cases. In 1965, through October 31, 1,840,000 cases were sold; through November, 2,170,000. ("Suisan Tsushin," Nov. 8, 1966.)

TUNA PRICES HIGHER IN LEADING PORT

Landings at the leading Japanese tuna fishing port of Yaizu in November 1966 totaled 7.152 metric tons worth 1,114,810,000 yen

	Quantity			Average Price		
	1966		1965	1966		1965
	Nov.	Oct.	Nov.	Nov.	Oct.	Nov.
	... (Metric Tons) ...			(US\$/Metric Ton)2/		
Tuna:						
Bluefin1/...	3,009	4,056	3,971	675	646	492
Albacore...	520	731	264	506	514	401
Skipjack...	2,348	4,500	1,559	236	220	254
Mackerel...	669	771	1,222	95	101	74
Others...	606	876	847			
Total...	7,152	10,934	7,863			

1/Includes yellowfin and big-eyed tuna.
2/To convert \$/metric ton to \$/short ton, multiply by .907.

Japan (Contd.):

(US\$3,097,000). Compared with November 1965, landings were down 711 tons but value was up \$355,000. Average exvessel prices, per short ton, compared with 1965 were: albacore \$459 (up \$96); skipjack \$212 (down \$18); mackerel \$86 (up \$20). ("Kanzume Nippo," Dec. 2, 1966.)

1966 POLE-AND-LINE SKIPJACK TUNA LANDINGS WERE APPROACHING NEW HIGH

Excellent skipjack tuna landings by the Japanese pole-and-line fishery in 1966, totaling 165,582 metric tons as of mid-September 1966, seemed headed to top the post-war record of 170,284 tons in 1962. About half the live-bait skipjack fleet ended fishing around mid-October 1966. The remaining vessels off Japan--in the area of 38°-40°20' N. latitudes and 144°-146° E. longitudes in late October--met concentrations of bird-associated schools. Some vessels landed up to 20 tons a day. Pole-caught skipjack landings over the past five years were: 1960--78,608 tons; 1961--144,327 tons; 1962--170,284 tons; 1963--112,887 tons; 1964--166,763 tons; and 1965--119,700 tons.

Exvessel skipjack prices in Japan averaged 90 yen a kilogram (US\$227 a short ton) in January 1966, rose to 100 yen a kilogram (\$252 a short ton) in March and April, began tapering off in May and June and, in July, dropped to 65 yen a kilogram (\$164 a short ton)--down 30-35 percent from prices a year ago. ("Suisancho Nippo, Oct. 26, 1966.)

SKIPJACK TUNA FISHERY IS REGAINING STRENGTH

The Japanese pole-and-line skipjack tuna fleet has been building up, stimulated by good fishing in recent alternate years and growing demand. The fleet had begun to dwindle after 1956 as vessels were transferred to the then prospering long-line fishery. Although the present fleet still is far below 1965's peak year, the fishery is attracting increasing attention because of the declining catch rate in the tuna long-line fishery.

The pole-and-line skipjack operations based at Yaizu, Shizuoka Prefecture, Japan's

leading fishing port, illustrate the growing activity of this fishery. Skipjack vessels registered there, close to 50 in 1958, dwindled to a low of 8 in 1963, but gradually increased to the present 20; 3 more vessels are scheduled to be added this spring.

Factors Aiding Fishery Growth

Other factors contributing to the renewed interest in the fishery were the adoption of a brine-freezing system on skipjack vessels, and the later development of new fishing grounds in Pacific waters south of the Marianas. The improved keeping quality of fish taken from distant waters and growing acceptance of brine-frozen fish in Japan, coupled with increasing exports of frozen skipjack to the United States, have increased demand for the species. The result has been that the price instability of earlier years has been greatly reduced. ("Suisan Keizai Shimbun," Jan. 5, 1967.)

INCREASES YELLOWFIN DIRECT-EXPORT QUOTA FOR U. S.

At its November 17, 1966, meeting, the Japan Frozen Tuna Producers Association increased the yellowfin export quota for direct shipment to the U. S. and Canada for the business year ending March 1967--from 30,000 short tons to 35,000 tons. Direct yellowfin exports from April to November 1966 totaled 22,500 tons, averaging about 3,000 tons a month. At that rate, it was felt, the existing quota would be consumed by the end of 1966. Direct albacore exports to the U. S. up to early December 1966 totaled about 20,000 tons, 15,000 below the established quota. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

FISHERY CATCH SETS NEW HIGH IN 1965

Fishery production, excluding whales, in 1965 hit a record 6,907,671 metric tons, according to data released November 8, 1966, by the Statistics and Survey Division, Ministry of Agriculture and Forestry. The 1965 production exceeds by almost 9 percent 1964's 6,350,706 metric tons; it exceeds by 0.6 percent the previous peak of 6,864,000 metric tons set in 1962. Squid and cuttlefish production marked a 51-percent increase over

Japan (Contd.):

1964; mackerel and sardines also showed substantial gains. But skipjack landings fell 18 percent below 1964. ("Suisan Tsushin," Nov. 10, 1966.)

1965 Catch of Principal Species by Type of Fisheries,			
Production by Type of Fishery	Quantity		Change from 1964
	1965	1964	
	.. (Metric Tons). .		Percent
Grand total	6,907,671	6,350,706	9
Sea fisheries:	6,381,629	5,868,732	9
Fish:			
Alaska pollock	690,895	683,880	1
Mackerel	668,574	495,664	35
Horse mackerel	526,885	496,451	6
Sardines	405,906	295,897	37
Saury	231,377	210,689	10
Skipjack tuna	136,067	166,763	-18
Albacore	127,341	116,487	9
Yellowfin	123,589	123,493	0
Big-eyed	110,486	112,256	-2
Bluefin	55,904	61,026	-8
Salmon	145,662	117,378	24
Others	1,855,544	1,955,125	-
Molluscs & crustaceans:			
Clams	293,330	287,367	2
Squid & cuttlefish	489,367	329,374	51
Shrimp & prawn	67,863	79,433	-15
Crab	63,568	53,512	18
Octopus	78,057	66,975	17
Others	46,291	66,579	-
Mammals	2,277	1,679	36
Seaweeds	252,637	248,724	2
Shallow Sea Culture	379,800	362,993	5
Inland Water Fisheries ..	113,148	89,201	27
Inland Water Culture	33,094	29,780	11

日本

South Korea

EXPLORES FISHING GROUNDS
IN SOUTH CHINA SEA

A 150-gross-ton Government research vessel left Pusan on December 15, 1966, to explore and develop new fishing grounds in the East and South China seas. The 84-day, 9,000-mile cruise calls for trial fishing with trawl and long-line gear in waters off northern Taiwan, Hong Kong, Thailand, Singapore, Borneo, and the Philippines.

The vessel was sent by South Korea's Fishery Development Board and the Fisheries Agency in an attempt to compensate for the declining coastal and offshore fishery re-

sources. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

UNABLE TO ENTER HIGH-SEAS
MOTHERSHIP SALMON FISHERY

The Republic of Korea (ROK) may not be able to enter the mothership-type salmon fishery in the North Pacific this year, according to the Japanese Embassy in Seoul. ROK's proposed purchase of an 8,000-ton refrigerated factoryship with part of the US\$20 million fishery loan she is now negotiating with Norway may not be approved by that Government.

In 1966, ROK had planned to order an 8,000-ton mothership from Japan with part of the \$90 million commercial loans to be provided under the Japan-ROK Economic Cooperation Agreement. But the plan was abandoned because Japan decided not to help build vessels that might be used in the high-seas salmon fishery. So South Korea's salmon fishing this year will likely be limited to small-scale, land-based operations. ("Suisan Keizai Shimbun," Nov. 30, 1966.)



Taiwan

SEEKS LARGER WORLD BANK
LOAN TO BUILD VESSELS

Taiwan, which is vigorously promoting development of its high-seas fisheries, is negotiating with the World Bank to increase its second loan application from US\$10.9 million to \$23 million. If approved, Taiwan hopes to expand its original program of purchasing sixteen 250-ton tuna vessels and four 1,500-ton trawlers. In 1964, the Government signed the first loan contract with the World Bank for \$7.8 million, with which to buy three 1,400-ton and thirteen 300-ton tuna vessels from Japan. All of these vessels are now in operation. Taiwan has about 55 tuna vessels operating out of American Samoa, 40 in the Indian Ocean, 4 at Espiritu Santo (New Hebrides), 6 at Port Louis (Mauritius Island), and 3 large vessels in the Atlantic Ocean scheduled to be reassigned to the Indian Ocean. ("Suisan Tsushin," Nov. 1, 1966.)



AFRICA

Ghana

STATE HAS 26 TRAWLERS

The trawler fleet of Ghana's State Fishing Corporation numbers 26, including 8 operated by Mankoadze Fisheries. The vessels were constructed in 4 countries: Soviet Union, 18; Japan, 3; Norway, 3; and the United Kingdom, 2. Total crew requirements are about 340. Recent discussions with the Norwegian Akers group may result in that group managing the Corporation's vessels. The group would also train Ghanaian personnel, a task formerly handled by Soviet technicians.

Japanese Trawler Contract Revised

Construction has been suspended on 5 of the twelve 750-ton trawlers contracted with Japan in 1965 for US\$1.6 million each. Four of the remaining 7 will be completed for Ocean Fisheries, a company owned by a Ghanaian businessman to whom the original Japanese credits are being extended. (U. S. Embassy, Accra, Dec. 15, 1966.)



South-West Africa

FISH MEAL PLANTS COMPLETE 1966 PILCHARD QUOTAS

The last of the 7 pilchard processing factories at Walvis Bay completed its 1966 quota during the first week of October. Each fish meal factory took its 90,000-ton quota with ease. ("The South African Shipping News and Fishing Industry Review," Nov. 1966.)



Foreign Fishing Off U. S. Coasts, December 1966

IN NORTHWEST ATLANTIC

Soviet: There were no Soviet fishing vessels on Georges Bank and vicinity during December 1966. A marked decline in mid-November was followed by a complete withdrawal

of all vessels by month's end. Since then, more than five weeks, no vessels were sighted. This is the first time in several years that the Soviet fleet has left Georges Bank for so long.

About 35 Soviet vessels were on Georges Bank and off southern New England during December 1965.

No Polish, East German, or Romanian fishing vessels were sighted on Georges Bank during December 1966.

MID-ATLANTIC BIGHT

Soviet: One medium trawler, sighted repeatedly off New Jersey and Virginia coasts, was presumed on exploratory trip.

IN GULF OF MEXICO

Soviet: No fishing vessels were sighted near U. S. coasts.

Cuban: Numerous vessels, mostly small, were sighted fishing in Straits of Florida and nearby channels and keys.

OFF CALIFORNIA

Soviet: Fishery research along California coasts has been conducted for several years. In early 1966, several research and exploratory fishing vessels were sighted--mainly in transit to and from newly exploited fishing grounds off Mexico (in Gulf of California and along Baja California) and in other Pacific areas.

In the first week of December, the 60-vessel Soviet fishing fleet off the Pacific Northwest since early April 1966 (8 months) left. It caught about 140,000 metric tons of Pacific hake and an undetermined amount of Pacific ocean perch. Most vessels sailed north to Hecate Strait area off British Columbia; some returned to Gulf of Alaska perch fishing grounds; some steamed to their Siberian home ports for repairs, overhaul, or change in crews. But about 20 moved south. They were reported on December 8, 1966, about 25 to 35 miles southwest of San Francisco: 9 large stern factory trawlers, 6 medium side trawlers, and 4 support vessels. They were fishing north of Cordell Bank and south of Farallon Islands along the 100-fathom curve, about 25 to 40 miles off California's northern coast (between San Francisco and Año Nuevo Point).



SOVIET VESSELS OFF SANTA BARBARA, CALIFORNIA: left, 3,000-gross-ton stern factory trawler "Ulianovsk" (crew of about 100); right, 10,000-gross-ton fish carrier and base ship "Arman" (crew of about 250).

There is no information on species fished but the area is traditional grounds for U. S. trawler fishermen seeking primarily rockfish.

By the end of December, almost all vessels returned north; only 4-5 large stern trawlers and one 10,000-gross-ton refrigerated fish carrier remained.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: Fishing activities were lowest since Soviet fleets appeared in April 1966.

During surveillance flights by U. S. Coast Guard during first 2 weeks in December, no Russian vessels were found. When area was checked the following week (Dec. 22), however, vessels were sighted. Two were off Washington and remainder off Oregon: 8 large stern trawlers, 2 medium side trawlers, and one support vessel. All were seaward of 12-mile contiguous fishing zone.

By December's end only 5 large stern trawlers remained off Oregon coast. When

sighted, their catch was primarily Pacific ocean perch.

OFF ALASKA

Japanese: Fishing activities increased during December. By month's end, there were 19 vessels.

The "Takachiho Maru" fished for perch off Southeastern Alaska until late December, then was replaced by the "Kirishima Maru." The "Ryuyo Maru" terminated perch operations on Albatross Bank about mid-month; it joined "Zuiyo Maru No. 2," "Kyoshin Maru No. 55," and "Tenyo Maru No. 3" and her accompanying trawler fishing for perch south of Fox Islands in eastern Aleutians. The "Taiyo Maru No. 82" and "Aso Maru" from Japan also joined this fleet at about same time. By late December, the Kyoshin Maru No. 55, Aso Maru, and Tenyo Maru No. 3 and her accompanying trawler departed--the Kyoshin Maru No. 55 returning to Japan, and the others switching to the pollock fishery north of the eastern Aleutians.

The Alaska pollock fishery north of the Fox Islands in eastern Aleutians was begun during December. The factoryship "Chichibu Maru" accompanied by about 8 trawlers began operations in mid-December; Aso Maru and Tenyo Maru No. 3 and her accompanying trawler from perch fishery south of Fox Islands arrived in late December.

Two long-liners fished for sablefish off Southeastern Alaska in late December.

Soviet: From 14 in early December, the Soviet fleet increased to 103 by month's end. This large increase resulted from transfer of vessels from hake and Pacific ocean perch fisheries off Pacific Northwest to perch fishery in the Gulf of Alaska and start flounder fishing in eastern Bering Sea.

In the Gulf of Alaska, in December 1966, Soviet perch operations were largest since June 1966. By month's end, many vessels had returned to Gulf from Pacific Northwest, and 20 trawlers and 10 support ships were

active on Yakutat grounds. Another 7 trawlers were fishing for perch along 100-fathom curve near Shumagin Islands at month's end.

The Shumagin Island shrimp fishery continued to increase in December--from 9 trawlers at beginning to 18 at month's end, the most trawlers in the fishery since it began in May 1965. With the arrival of a newly constructed 12,700-gross-ton canning factoryship, "Vasilii Putintsev," in late December, the processing method was changed from freezing shrimp in the round aboard trawlers to hand-peeling them for canning aboard factoryship.

An exploratory medium trawler was sent to the Bering Sea to conduct reconnaissance fishing for herring off the Pribilof Islands.

The Soviets began their eastern Bering Sea flounder fishery about one month earlier than usual: 10 vessels began fishing in mid-December. By month's end, there were over 50 vessels.



SEARCH AND RESCUE BY THE U. S. COAST GUARD

Modern search and rescue is a complex function, involving the closest cooperation between Coast Guard air, sea, and shore units. Most current means for attaining this coordination is the Automated Merchant Vessel Reporting program (AMVER) established in 1958. Nerve center for AMVER is the Coast Guard's Rescue Coordination Center in New York City. The program has proved so successful that it will soon be extended to the Pacific. Under AMVER procedure, vessels voluntarily report their positions periodically to the Coast Guard at New York. The data are processed by an electronic computer and provide the most current information for Coast Guard rescue coordination centers. Thousands of foreign and U.S. vessels are taking part in the program and the number is growing steadily.

Offering great promise in search and rescue is the new datum marker buoy. This is a device similar in size to a droppable sonar buoy. It carries a small, battery-powered radio transmitter incorporated in a bomblike container. It can be dropped from aircraft at a height of 1,000 feet. On entering the water, the buoy floats and transmits a signal on UHF. This makes it possible for search and rescue aircraft to home in on it, using UHF direction finders.

The buoy has been successfully tested and is now undergoing operational evaluation. Recent studies show that the buoy can be operated for over 50 hours and its signal can be picked up by aircraft at a distance of 50 miles. (Release No. 16-65, U. S. Coast Guard, Washington, D. C.)

ARTICLES

THE SURF CLAM FISHERY

By Thomas M. Groutage and Allan M. Barker*

The 1965 surf clam (*Spisula solidissima*) fishery landed a record 44 million pounds of clam meats. New Jersey landings composed 96 percent of the total; the center of the fishery was Point Pleasant. Less than 2 percent of the total landings was used for fish bait. The hydraulic jet dredge was the principal gear. Sampling at Point Pleasant, Cape May, and Wildwood, N. J., provided data about the fishery. Daily catches averaged 355 bushels at Point Pleasant and 413 bushels at Cape May-Wildwood. Clams landed for processing had a mean shell length of 151 mm. (6 in.) at Point Pleasant and 139 mm. (5½ in.) at Cape May-Wildwood.

The surf clam is the largest bivalve mollusk living on the Atlantic coast (Miner, 1950). The fishery has existed since the late 1800s and contributes about 5 percent of the total U.S. annual shellfish landings. Regular sampling of the fishery was initiated in October 1964 when a field office was established at Point Pleasant, N. J., by the Surf Clam Program, Biological Laboratory, Oxford, Md. This report is a summary of the 1965 fishery.

FISHING AREA

Surf clams were harvested in two principal areas along the New Jersey coast. The largest and most productive grounds were between Barnegat Lightship and Point Pleasant (fig. 1). Point Pleasant, the center of commercial landings, had a total surf clam fleet of about 40 vessels. A few (2 to 5) boats were based at Barnegat Inlet. Depth of clam beds ranged from 15 to 37 meters (48 to 120 feet); average depth was 22.3 meters (73 feet). Point Pleasant boats traveled 1 to 3 hours to reach the offshore clam beds. Figure 1 also shows the second fishing area off Cape May. About 8 boats operated out of Cape May and Wildwood, traveling 1 to 2 hours to the inshore or offshore beds. Clam beds in this area were 9 to 37 meters (30 to 120 feet) deep--averaging 12.3 meters (40 feet) on the inshore beds and 21.3 meters (70 feet) on the offshore beds.

Plants in Point Pleasant, Cape May, and Wildwood received clams directly as the boats

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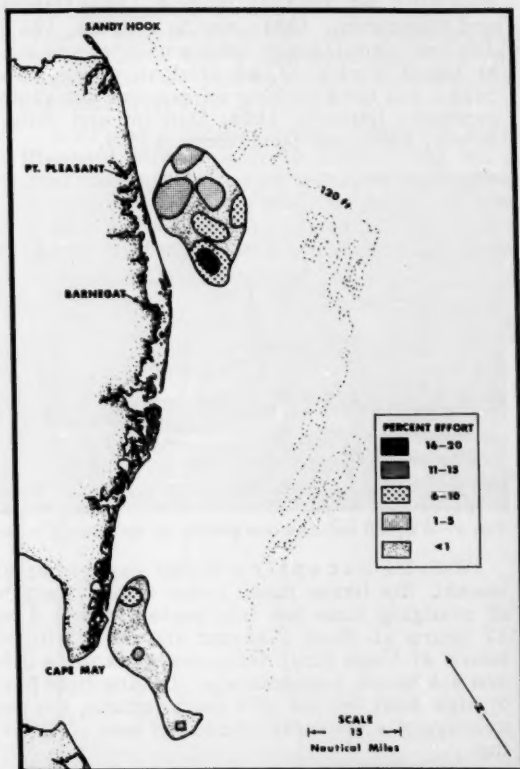


Fig. 1 - Location of surf clam dredging effort off the New Jersey coast in 1965 (percent of total New Jersey effort).

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 780

were unloaded and processed the clams the next day. Clams or clam meats were trucked to processing plants at: Port Norris and Leesburg, N. J.; Lewes, Del.; and Pine Point, Maine. Shucking was by hand although some mechanization assisted in cleaning. Fresh meats were canned or iced for shipment to markets and restaurants.

GEAR AND METHODS

Clam boats (fig. 2) are modified or converted vessels (trawlers, scallopers, and oyster schooners) from other fisheries. Surf clams are taken commercially with hydraulic jet dredges (Ropes, 1960; Dumont and Sundstrom, 1961; and Sundstrom, 1957). The bait clam fishery used small jet and other types of shellfish dredges, tongs, hand rakes, and hand picking on exposed intertidal sandbars (Brandt, 1964; Dumont and Sundstrom, 1961; and Sundstrom, 1957).

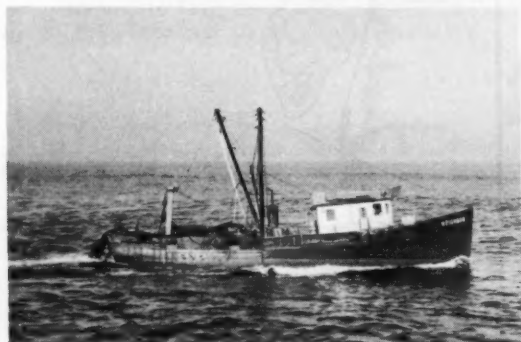


Fig. 2 - A typical surf clam boat heading for the fishing grounds.

With the exception of one experimental vessel, the boats made 1-day trips. Length of dredging time per trip varied from 1.5 to 17 hours at Point Pleasant and from 2 to 20 hours at Cape May; daily averages were 8.9 and 6.4 hours, respectively. Towing time per dredge haul varied with each captain, but an average of 4 tows were made per hour of fishing.

LANDING STATISTICS

New Jersey landings were sampled throughout the year at Point Pleasant and Cape May-Wildwood to obtain statistical data.

¹/The table "Surf Clam Catch for the Atlantic Coast of the United States," is attached as appendix to reprint (Separate No. 780) of this article. For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.

Sampling was concentrated at Point Pleasant, but weekly visits were made to the Cape May-Wildwood area. Sampling was increased to twice weekly at Cape May-Wildwood in late winter and early spring, when effort increased in this area. Over 1,000 interviews of vessel captains were obtained for information on fishing location and effort; 785 samples from landings were examined for length of commercial-size clams (17,000 clams were measured). Twenty trips were made on commercial vessels, where 7,400 clams were measured from catches made in 214 dredge hauls. The amounts of surf clams landed along the Atlantic coast were taken from "Current Fishery Statistics" bulletins.

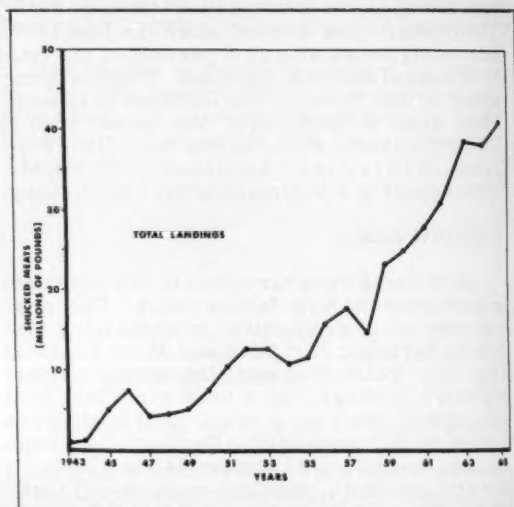


Fig. 3 - Annual surf clam landings, 1943-65.

Total landings of 44 million pounds of surf clam meats set a new high in 1965 (fig. 3 and table 1.) The previous high was 38.6 million pounds in 1963. Greater demand for the product, increased effort, and increased gear efficiency have contributed to this rise. Ninety-six percent (42.3 million pounds of meats) of the total landings were made in New Jersey, 3.4 percent (1.5 million pounds) in New York, and 0.6 percent (0.3 million pounds) in Maryland. Approximately 1.6 percent (660,000 pounds) of the total New Jersey catch, 25 percent (68,400 pounds) of the Maryland catch,

and 51 percent (766,000 pounds) of the New York catch, were used for bait in the sport fisheries.^{2/} Landings in Rhode Island and Massachusetts were insignificant and were used entirely for bait.

Over 79 percent (33.5 million pounds of meats) of the New Jersey landings were made at Point Pleasant and Barnegat. Winter weather restricted dredging in deeper waters off this area. In late January and February, about 20 boats moved from Point Pleasant and Barnegat to the Cape May-Wildwood area. The nearness of the fishing area to shore off Cape May enabled boats to operate during inclement weather. Most of these vessels returned to Point Pleasant before June. Daily landings per boat at Point Pleasant ranged from 510 to 18,820 pounds of meats (30 to 1,107 bushels) and averaged 6,035 pounds (355 bushels). Catch rate per hour of dredging averaged 678 pounds of meats (40 bushels) (fig. 5).

Cape May landings amounted to nearly 20 percent (8.4 million pounds of meats) of the New Jersey total. The shifting of effort from

Point Pleasant to Cape May-Wildwood, from February through May, accounted for high landings at Cape May-Wildwood during that period. The March total was the only one that surpassed Point Pleasant monthly totals. These large catches were produced by an extensive harvest of smaller clams from in-shore beds. In February through June, the daily catches per boat averaged 8,942 pounds of meats (526 bushels); the hourly catch rate was 1,542 pounds (90 bushels) (fig. 5). Catch diminished rapidly at Cape May in July when the boats moved offshore to catch the less numerous but larger clams (fig. 4). From July through October, the catch rate per hour was 496 pounds of meats (29 bushels). In November and December, the boats again dredged near shore and catch increased slightly to 697 pounds of meats (41 bushels) per hour (fig. 5).

Lengths of surf clams landed at Point Pleasant were relatively uniform (fig. 4). A total of 12,910 clams measured throughout the year had a mean shell length of 151 mm. (6 in.) and a range of 120 to 180 mm. ($4\frac{3}{4}$ to $7\frac{1}{8}$ in.)--fig. 6. Clams landed at Cape May-

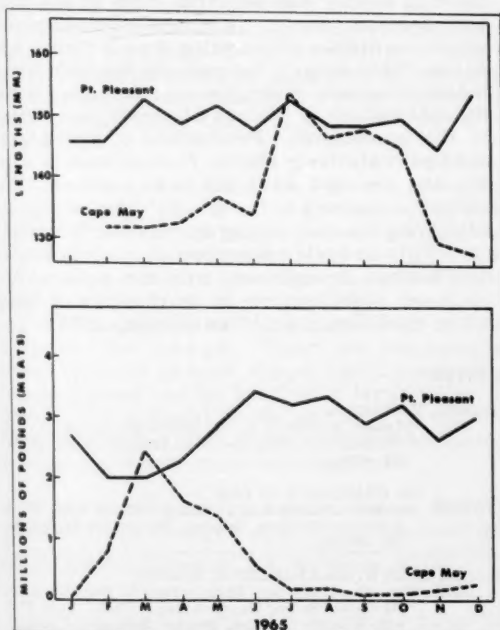


Fig. 4.- Mean lengths of surf clams and monthly landings of surf clam meats in New Jersey in 1965.

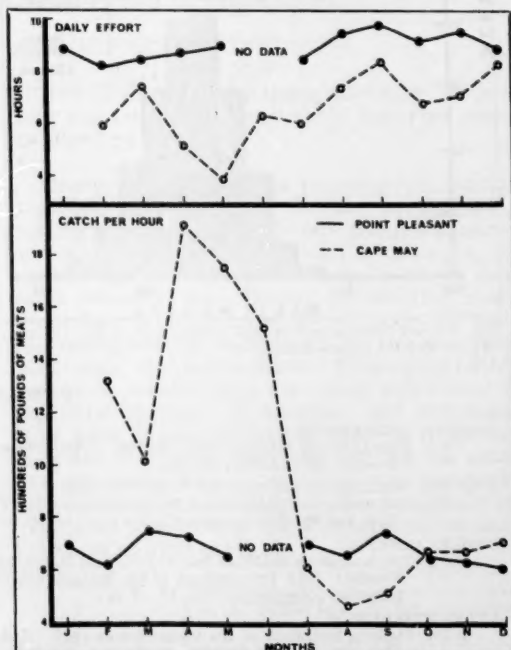


Fig. 5 - Monthly averages of daily effort and catch per hour at Point Pleasant and Cape May, New Jersey, 1965.

^{2/}Data provided in personal communications from BCF, Office of Statistical Services, Fishery Reporting Specialists, in the respective states.

Wildwood had a smaller mean length than Point Pleasant clams; for 4,466 Cape May clams measured throughout the year, the range was 105 to 180 mm. ($4\frac{1}{8}$ to $7\frac{1}{8}$ in.) and the mean length was 139 mm. ($5\frac{1}{2}$ in.)--fig. 6. The difference in lengths between clams in the inshore and offshore beds is evident in figure 4; the lengths for February through June, and for November and December, were determined from inshore clams.

At Point Pleasant, amounts of small clams (less than 130 mm. or 5 in.) discarded at sea

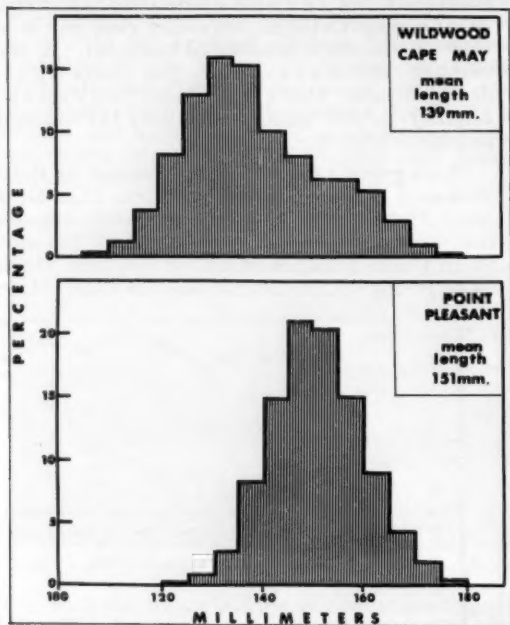


Fig. 6 - Surf clam lengths in 1965 commercial catch (139 mm. = $5\frac{1}{2}$ in. and 151 mm. = 6 in.).

were negligible--about 1 bushel per 200 bushels landed. No clams were discarded in the Cape May-Wildwood area.

STATUS AND TRENDS OF THE FISHERY

Information from interviews with vessel captains indicates fishing effort has increased in the last few years. The average length of surf clams caught in the Barnegat Lightship area, however, has remained at about 150 mm. (6 in.).

Many factors affect the catch and effort of the surf clam fleet. Weather is perhaps the most important limiting factor in boat operation, hampers proper dredging, and increases hazards to the crews in handling dredges. Data in this report do not emphasize the importance of wind because the larger, more efficient boats were able to fish during adverse weather and make higher catches than the fleet average during good fishing conditions.

The industry imposed catch quotas at various times to compensate for slight fluctuations in supply and demand. Size preference was a minor factor in limiting production--shuckers dislike processing small clams because their salary depends on the volume of meats shucked. Also, the smaller the clams, the less return in pounds of meats per bushel to the processor. Production of surf clams has been relatively stable; fluctuations in supply and demand have not been marked. The industry appears to be in a healthy condition, satisfying the increasing demand for its product. This orderly expansion of an industry is heartening. It contrasts with the general decline or stabilization in production of many other shellfish industries (Engle, 1966).

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TECHNOLOGY'S ROLE IN THE SEAFOOD INDUSTRY

By Harold B. Allen*

BCF's Branch of Technology is a tool for helping the fishing industry. The Branch has inspectors, scientists, engineers, and technicians in laboratories throughout the United States—in Gloucester, Massachusetts; College Park, Maryland; Pascagoula, Mississippi; Ann Arbor, Michigan; Terminal Island, California; Seattle, Washington; and Ketchikan, Alaska. Three are small ones employing 5 to 15 people; 4 are larger and have 15-25 employees. Many of the scientists have advanced degrees in engineering, bacteriology, chemistry, and nutrition.

The Branch also includes a nationwide inspection service with fifty-six inspectors. They work in 10 lot-inspection offices in major cities and in 33 fish and shellfish processing plants.

WHAT ARE THE PROBLEMS?

The technological problems are many and complex. They begin on the fishing vessel—even before the catch is removed from the water. They involve losses in quality when fish are left in gill nets or purse seines too long. Then, as the catch is brought aboard, the technological problems begin to multiply: techniques must be found to preserve or process quickly and economically the wide variety of fish and shellfish taken in different parts of the country.

As we move our catch into shore-based processing plants, or to fresh and frozen fish markets, a new challenge arises: the need to process and market extremely variable and diverse products in competition with other protein foods, such as poultry, eggs, meat, and milk. Processors of these other foods have a distinct advantage. Their raw material is more uniform in size, shape, quality, and perishability and can be handled in large volume. These agricultural foods can be grown and harvested at the ideal time—rather than hunted and caught when opportunity permits.

A new set of problems arises as our fishery products are merged with other foods in the

retail distribution chain. With the possible exception of fresh fish, the product leaves the control of industry at that point. The technical and quality problems encountered in the distribution of frozen fish have been highlighted in Consumers Union Reports since 1961. The magazine stated that up to 40 percent of the fish and shellfish tested in the marketplace was substandard in quality; as a possible solution, it recommended adoption by the States of the Frozen Food Code of the Association of Food and Drug Officials of the U.S.—and mandatory Federal inspection from the boat level forward.

A final technological problem is that we have not developed the technical know-how and processing methods to utilize the many abundant species of fish that do not now enjoy wide industry and consumer acceptance. As examples, mullet, mackerel, hake, and shark are not being utilized because industry concentrates on salmon, haddock, and flounder. I believe that products can be developed from these underutilized species that will tempt the consumer and increase sales.

HOW BCF SERVES INDUSTRY

How is Government using its tools—scientists and laboratories—to help industry solve its many problems?

One principal activity is research leading to quality improvement. Studies on improving quality are being carried out in our 7 laboratories. At Terminal Island, for example, we are working to improve the quality of raw tuna as it reaches the cannery by learning more about the effect of harvesting methods and vessel-refrigeration techniques on the condition of the fish. In Alaska, we are developing better means of maintaining the color and flavor in northern shrimp. In Seattle, our scientists have gone to sea on halibut vessels in search of better means of icing and storing the catch in a vessel's hold. A technique was developed for washing the blood from the large dorsal vein, thus preventing the development of dark areas in halibut steaks.

*Chief, Branch of Technology, BCF, Washington, D. C.

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 781

QUALITY STANDARDS ADOPTED IN 1958

Perhaps the most significant overall quality-improvement program is the development of official U. S. Standards for fishery products, and the inspection service based on these quality standards. Since the program was started in 1958, fifteen standards have been developed and promulgated. Even more Federal and State purchase specifications have been developed. In 1965, 230 million pounds of fishery products were inspected or certified under our program. More than any other, this program illustrates Government and industry cooperation in quality improvement.

Our laboratories in Pascagoula, Mississippi; Ann Arbor, Michigan; and Seattle, Washington, are working to solve microbiological problems encountered by industry. The work by scientists at Ann Arbor has resulted in the development of a three-part smoked-fish sanitation manual: Part I, "Sanitation in the Processing Plant," is being printed and should be available for distribution about March 1967. Part II, "Sanitation on the Fishing Vessel," is in draft status and being reviewed. The first draft of Part III, "Processing Procedures," will soon be completed. The laboratory, industry, the States, and cities, are playing vital roles in controlling bacteriological problems.

UTILIZATION RESEARCH

Another broad area of study where we are finding solutions to problems is utilization research. Industry is not utilizing fully such species as hake, mullet, alewife, and anchovy. Therefore, food and industrial studies are underway in Seattle to develop new food and industrial products. Our present efforts are aimed principally at shark and hake. Work in the future will involve other species. To date, the most promising results have been obtained in such industrial products as refined shark oil and hake fish meal; but excellent shark steaks and hake breakfast sausages have been prepared. These developments may foreshadow basic changes in the species composition of our domestic catch.

FUTURE OF FISHERY TECHNOLOGY

Research is already far advanced in BCF laboratories on processes that will be important to the industry's future. One is radiation preservation of "fresh" fish. The irradiation of fish at the time of packing can double the

normal high-quality shelf life--and enable marine species to reach inland markets in prime condition.

Our Marine Products Development Irradiator in Gloucester, Massachusetts, irradiates fishery products and for evaluation, test-ships many of them to army bases and laboratories in different parts of the U. S.

During summer 1966, this research program was expanded to include shipboard irradiation studies. A small irradiator was placed aboard our Gloucester exploratory fishing vessel "Delaware" to study irradiation at the moment of catch. The purpose was to prevent the loss of quality normally experienced at sea. We have been pleased with the preliminary results and feel this approach has much promise.

FISH PROTEIN CONCENTRATE (FPC)

One of our most exciting and far-reaching programs is the manufacture of fish protein concentrate (FPC). The object is to develop a manufacturing process for an inexpensive and high-quality protein food that meets the approval of the Food and Drug Administration. We have now completed the program's first phase with the development of a solvent-extraction process. A petition requesting approval was submitted to the FDA in February 1966. FDA has periodically requested additional data, which we have been providing.

Congress recognized the potential value of FPC when it authorized the leasing and construction of two pilot demonstration plants and the associated research. Once these plants are available, our scientists will be able to carry out engineering and design studies needed by private industry to construct larger, full-scale commercial plants. FPC produced in these pilot plants will be used in feeding studies to test the feasibility of incorporating it in the many different foods consumed in developing countries. In this way, markets will be established for FPC, which will be produced commercially at a later date. We believe the FPC program has a tremendous potential for improving the economic condition of the U. S. fisherman and providing badly needed protein to the hungry people of the world.

BASIC RESEARCH FOR FUTURE

The research that leads us farthest into the future is often termed "basic." Much of it

is underway at Gloucester to determine the fundamental cause of toughening in fish when it is frozen and held in storage. Results have already shown that toughening results from a bonding of the natural protein and oils in the fish meat. If this bonding can be prevented, it may be possible to maintain the full quality and texture of fresh fish in the frozen product.

Similar studies on the basic cause of "fishiness" in fishery products when they are cooked are being carried out in Seattle. These odors are associated with the oxidation of the natural oils in fish. If we can control oxidation--and perhaps thereby control this fishiness--it may be possible for a housewife to cook fishery products with no fear that an unpleasant odor will be left in her kitchen.

If we look even farther into the future, we see an area where no technological work is now being done but which has considerable need and promise. Of prime importance is the need to develop space-age fish-handling techniques for use aboard U. S. freezer trawler vessels. Such techniques might include containerization of an entire fish hold so that it

could be lifted from the vessel as it reaches dock and be replaced by an empty hold. The vessel then could more quickly return to the fishing grounds.

A refinement of this concept would be to seal the hold after the fish are placed inside and then pump out the air. Replacing the oxygen-laden air with a controlled atmosphere of nitrogen and carbon dioxide could greatly extend the storage life of fish by slowing natural bacterial growth and oxidation. This process would be especially useful in landing high-quality fresh fish.

Another plan might involve irradiation, freezing, filleting, or FPC manufacture at sea. Any of these processes could be undertaken on the fishing grounds with no need for the vessel to return to port. Instead, cargo vessels could bring the finished product to port and supply the fishing vessel with fuel and, perhaps, with replacement crews.

There exist many other far-out possibilities for our industry if we think in space-age terms. I believe we should.



RADIATION PRESERVATION OF SEAFOOD

U.S. DEPARTMENT OF THE INTERIOR • BUREAU OF COMMERCIAL FISHERIES



FRESH SEAFOOD ON ICE
WILL KEEP ABOUT 14 DAYS

**IRRADIATION
WILL DOUBLE THIS
KEEPING TIME AND
INCREASE
FRESH FISH SALES**

HIGH QUALITY
FRESH FISH
WILL REACH



INLAND MARKETS

**COOPERATIVE
GOVERNMENT-INDUSTRY
STUDIES**

TECHNOLOGICAL RESEARCH
WILL ENABLE US TO EXTEND YOUR
MARKETS FOR FRESH FISH BY

- selecting suitable species
- determining optimum radiation levels
- establishing maximum storage time at different storage temperatures
- providing for FDA wholesomeness determinations
- testing and selecting packaging materials
- conducting economic feasibility analysis



Exhibit demonstrating the usefulness of radiation preservation of seafood.

Catches of up to 18 metric tons of yellowfin and 17 metric tons of skipjack per set were made with a new experimental 550-meter purse seine.

EXPERIMENTAL PURSE SEINING FOR TUNAS IN PORTUGUESE WEST AFRICA 1/

By Fernando Correia da Costa and David Bragança Gil

(Translated from Portuguese by John P. Wise*)

Capture of tuna by purse seines was made possible by technical advances in two fields--the discovery of new fibers for making nets and the invention of mechanical devices for hauling nets. Before these developments, ordinary purse seines had been used to capture the tunas so abundant in various parts of the world. Good results were achieved only occasionally. It was soon recognized that future attempts could only be profitable with gear designed especially for the purpose. This gear, if possible to construct, would consist of larger nets made of stronger twine. However it would be difficult to handle; actually, such nets made of traditional fibers would be too heavy for manpower alone to manage.

The first step toward solving the problem appeared in the development of synthetic fibers, much stronger and lighter than vegetable fibers. This made possible the construction of larger and stronger--yet lighter nets. Although the weight problem had been solved, the larger nets made manual handling slow and exhausting.

The second step was the development of the mechanical hauler or power block. This gear is handled easily and is relatively simple to install without major modifications of traditional vessels. It opened the way to fishing with large purse seines; seining for tunas became practical. Now seining is practiced profitably in all countries that have proper oceanographic conditions along their coasts or in nearby waters.

*Fishery Biologist, BCF Tropical Atlantic Biological Laboratory, Miami, Florida. Certain editorial changes were made in translation, with the authors' approval, to improve readability.

1/"Ensaio de pesca de 'atum' em Angola com rede de cercar para bordo."

Note: "Notas Mimeografadas do Centro de Biologia Piscatória, No. 45," July 1965. Published by "Junta de Investigações do Ultramar," Lisbon, Portugal.

In Angola, Portuguese West Africa, a live-bait fishery for tunas has existed for several years. Some owners and captains of traditional seiners have tried to catch tunas with nets normally used for sardines and other pelagic fish. Although some catches were made, the idea was not followed up for practical reasons. Larger and stronger nets were needed, but these could not be handled in the ordinary manner.

At the beginning of 1961, following its policy of experimentation and practical demonstration of new fishing methods, the Marine Biology Mission installed on its research vessel "Sardinella" a mechanical hauler for purse seines. (See "Notas Mimeografadas do Centro de Biologia Piscatória," No. 34.) In 1963, a tuna purse seine was bought from an American firm that was designed with the Sardinella's available power and power block in mind.

MATERIALS

The Sardinella is a wooden "Portuguese seiner" type built in Angola in 1958:

Maximum length	23.1 meters
Length between perpendiculars	19.1 meters
Draft midships	2.4 meters
Beam	5.3 meters
Tonnage	123.26 gross tons

The main motor is a Bohn and Kahler 6-cylinder diesel developing 160 hp. at 600

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 782

r.p.m., for a speed of about 7 knots. The power block is American made, "Marco Type 28F - 2000 GR," with a pulling force of about 800 kilograms and a drum capacity of about 90 centimeters (maximum circumference of compressed net). (For more details, see "Notas Mimeografadas do Centro de Biologia Piscatória," No. 34.)

As would be expected, the *Sardinella* also had a mechanical winch driven by a 30-hp. auxiliary motor. This low horsepower and the winch's bad condition necessitated some changes. We thought first of a hydraulic winch, but its larger size and possible parts and maintenance problems made us settle for an ordinary mechanical winch made in Angola. This is driven from the main engine and has two speeds and two gypsies of different sizes on each side.

It was first proposed that we design a net for seining tuna from the *Sardinella* and that it be constructed in Angola. This would have meant a typical machine-knotted net. Because the net was the first of its sort for seining tuna in Portugal and there was no unanimous opinion on the best type, we were compelled to design it from general information about seines and our knowledge of Angola tunas. We thought the "American purse seine" used in Portugal would be a suitable base. This seine has the following characteristics:

Length of cork line	675 meters	
Depth (slack)	75 meters	
Overall mesh (bar)	40 millimeters	
Bag {	Length	75 meters
	Depth	30 meters
	Mesh (bar)	30 millimeters
Cork line selvage (bar)	40 millimeters	
Lead line selvage (bar)	80 millimeters	

The webbing is nylon twine, about 1,000 meters/kilogram overall, and about 800 meters/kilogram in the bag and selvages. We considered modifying the bag's design to the Icelandic type, cut in steps, because we believe this is the only proper type for mechanical hauling.

However, we decided later that our power block and vessel could not handle the weight involved. Finally, we turned to the idea of a knotless net, ending the notion of having it made in Angola. The most efficient knotless mesh, principally from the standpoint of strength, seemed to be the American "Tri-

lock nylon combination." We ordered one from the United States Net and Twine Co., Inc.; it was made under the direction of Borti Petrich.

The net is about 550 meters long and 70 meters deep. Its total weight, including leads and floats, is about 6,500 kilograms. The purse line is nylon with an outer winding on an inner core for extra strength; it is the American type "Samson 2 in 1," 25.4 millimeters in diameter and 580 meters long. We had to use this rather than steel cable because it was impossible to mount the necessary winch for steel on the *Sardinella*. We still believe that the purse lines normally should be steel, although the substitute proved satisfactory in all respects.

The net is divided in two parts by a splitting arrangement ("zipper"), making it possible to divide the catch in case of a large set. This arrangement is simply a line of small rings running up a reinforced strip of netting. A line made fast to the lead line passes through the rings with its free end passing out at the cork line; a pull on this line splits the net. This system is commonly used in the U. S. It was incorporated in our gear at the manufacturer's suggestion.

There are two other important design features:

a) Unlike the classic Portuguese net, the net does not form pockets at the bow and stern of the vessel. For this reason, taking the basic idea from Mr. Petrich, we had installed along the extreme end of the net and along the side of the bag a line of small rings through which passes an auxiliary line. When drying up is nearly completed, this line is pulled in when necessary. This pulls the net together--bunching up the corks and forming a large pocket under the cork line--and prevents fish from jumping out of the net when they are crowded by it. The same rig was installed on the other end of the net and along the cork line of the center of the bag; however, the latter had to be removed because it created problems during hauling.

b) There are 20 small rings along the lead line under the bag. This permits fastening the bag securely to the vessel's rail while brailing.

Because we were forced to use a net whose weight and volume were adapted to the

existing vessel and power block, we not only had to choose a knotless net but also to limit the twine's diameter to a minimum. We found the net efficient for fishing, but it was too weak under certain conditions. In the future, we could have larger meshes and heavier twine, maintaining the gear's weight and volume about the same. Nonetheless, after using the net, we consider it very good, subject to the limitations mentioned.

OPERATIONS

The *Sardinella*'s limitations led us to select a "European system" fishing method--seining with live bait. This is distinguished from the "American system," which does not use bait. The low power of the vessel's motor (160 hp.) does not permit speeds of more than 7 or $7\frac{1}{2}$ knots, just about eliminating chasing or seining moving schools. In the European system, the bait boat acts as a "brake" on the school; it works closely with the seine vessel and permits the latter to make sets on schools stopped by the live bait.

The low power (about 25 hp.) of the available bait boats allowed speeds of only $5\frac{1}{2}$ or 6 knots. This, plus the small holding capacity of the bait tank (about 1.5 cubic meters), ruled out scouting for fish over large areas. These boats can work at sea only 12 to 14 hours and are limited to operating close to port--on the continental shelf, or a little beyond. This limited our operations and the information we could obtain on possible offshore tuna fishing.

The net's design considered many factors; it should have been restricted to catching small schools of small to medium fish. On one occasion, to test the net, we deliberately ignored the limitation and made a set around an estimated 30-ton school of large fish, about 40 kilograms each. Although we caught 18 tons, we proved in fact what we knew in theory--the larger part of the school escaped by breaking through the net.

It is well known that one principal cause of the movements of tunas is related to the water's temperature and salinity. Tunas are limited in their ability to withstand large changes in temperature and salinity, and their migrations are affected by these and other factors. Our knowledge of local oceanographic conditions is somewhat limited. This, and the vessel's limited range, did not allow us to select the best fishing grounds.

Our scouting was held to traditional methods--looking for birds, surface or subsurface schools, or just prospecting where tunas have been found.

Around Baia Farta, the tunas come from the north and begin to show up around mid-September; they stay until the end of April or the beginning of May, when the cooling surface waters sends them north again. It seemed obvious to us that the best months for finding large concentrations are October to January, especially November-December. However, reasons beyond our control made it impossible to begin then. The first trials for testing gear and training ran from the latter part of December 1964 to early January 1965. Only then, in mid-January, was it possible to have everything ready to begin the actual fishing experiments.

To sum up, we had to limit our work in several ways:

- a) to seine with the aid of live bait;
- b) to start in January, past the peak of the season;
- c) to catch fish of 15 to 20 kilograms in small or medium schools;
- d) to scout within 30 or 40 miles of port; and,
- e) to scout for tunas only in the usual places and by the traditional methods.

The operations were carried out in the following sequence.

1. Dummy sets, without attempting to catch fish, were made from the *Sardinella*;
2. Dummy sets, without attempting to catch fish--the *Sardinella* working with live bait launch;
3. Fishing sets, seining tuna schools with the aid of live bait.

The first group was carried out to test gear and to give the crew sufficient practice in handling the new net. These tests were conducted over known areas of clean bottom at or near the entrance to Baia Farta, under various weather and sea conditions, until we were convinced that men and gear were ready for the next phase.

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After the first phase, we worked on getting the two fishing vessels and their crews (with basically different habits) to function together as a single unit.

When we were ready to scout and fish with the seine vessel working with the bait boat, we began the third phase. We set up certain operational procedures:

1. The two vessels operated as a single fishing unit;
2. The bait boat scouted in the usual manner for pole-and-line fishing;
3. The seine vessel followed the bait boat at a determined distance, directly astern when possible;
4. The boats were in constant contact by walkie-talkie radio;
5. Scouting was carried out visually from both vessels--by looking for birds or jumping fish;

6. A Marine Biology Mission scientist in charge of the joint operation was aboard the bait boat;

7. When the bait boat sighted signs or actual fish, it began operations as if it were going to fish by the usual method;

8. The scientist aboard followed developments closely and decided the appropriate time to radio the seine vessel to begin setting;

9. A firm rule held that the bait boat should chum and prepare the fish without, however, fishing;

10. Rules had been set up for setting the seine: the set should be begun as far as possible from the bait boat, made rapidly, and the seine should be closed as close as possible to the stern of the bait boat;

11. Rules were set for the bait boat: Continue chumming generously, without stopping, during seine set until rings were aboard seine vessel; steam around inside seine, find best

Details of Sets Nos. 10-25 of the Experimental Purse Seine^{1/}

Set No.	Date (1965)	Catch		Observations
		Species	Weight (Kg.)	
10	12 Jan.	Skipjack	400	Set too close to bait boat - fish dived
11	12 Jan.	-	0	Attempted to set without chumming
12	12 Jan.	Skipjack	2,000	Small school - good set
13	16 Jan.	Skipjack Frigate mackerel (few) Yellowfin (3)	17,000	Good set - only a few escaped
14	19 Jan.	Skipjack Frigate mackerel (few) Shark (1)	450	Big school - bad set with large opening - radio failed
15	27 Jan.	Dolphin (many) Yellowfin (14) Skipjack (6) Shark (2)	500	Good set
16	27 Jan.	Yellowfin Bigeye (2)	18,000	Big school - good set - many fish broke through net
17	2 Feb.	Skipjack Frigate mackerel (few) Yellowfin Shark (20)	16,000	Big school - set with large opening - many fish escaped
18	20 Feb.	Yellowfin (1,500 kg.) Skipjack (1,000 kg.)	2,500	Big school - fish dived because bait died as net was set
19	6 Mar.	Skipjack Yellowfin (few) Bigeye (few) Shark (1)	250	Few fish - not feeding well - good set
20	17 Mar.	Skipjack Frigate mackerel (few)	150	Few fish - not feeding well - good set
21	17 Mar.	Skipjack	150	Few fish - not feeding well - good set
22	30 Mar.	Skipjack Little tuna (few)	5,000	Small school - good set
23	30 Mar.	Skipjack Yellowfin Jack	300	Few fish - not feeding well - good set
24	2 Apr.	Skipjack	50	Few fish - not feeding well - good set
25	2 Apr.	Skipjack	700	Few fish - not feeding well - good set

^{1/}All sets within 15 miles of 13°00' E. and 12°35' S., except No. 18 about 40 miles southeasterly of this position. None over 20 miles from the coast.

position to prevent escape of fish--remembering the bait boat should stay away from net itself, especially from opening, try to guide school into the circle, especially when net is almost closed (these maneuvers produced excellent results in preventing escape of fish during setting and pursing);

12. Once pursing is completed, the bait boat leaves the circle and, by means of a tow line, helps the seine vessel keep away from body of the net as it is lifted by power block;

13. When this operation is over, the bait boat helps with the drying up by taking part of the cork line aboard; when there are plenty of fish, this operation keeps tunas from sinking cork line and escaping over it.

The total number of sets made was 25: six dummies were carried out for practice with the gear and training the Sardinella crew; 3 for practice with two vessels operating together; and 16 (numbered 10-25), actually fishing with live bait and the seine.

Species captured in order of value were: skipjack (Katsuwonus pelamis), yellowfin (Thunnus albacares), frigate mackerel (Auxis thazard), bigeye (Thunnus obesus), little tuna (Euthynnus alletteratus), dolphin (Coryphaena hippurus), jack (Caranx angu- lensis), and sharks (various species).

The total capture for the 16 sets was 63,500 kilograms, or about 4 metric tons average per set. Skipjack (42,000 kilograms) and yellowfin (19,000 kilograms) made up almost the whole catch, with only 2,500 kilograms of other fish.^{2/} Because of the small number of sets, it is not now possible to draw conclusions about the economic yields. Study of this question will be feasible in the near future only after an intense campaign set up as in commercial fishing and covering a whole season. The relatively low capture per set (3,968 kilograms) was due to the experimental nature of the work, attempts to set as frequently as possible in all conditions to test the net, and problems previously mentioned. (See observations in table.)

^{2/}Fernando Correia da Costa mentioned in conversation that this work was carried on from November 1965 to February 1966, with about 20 more sets. Catches were about the same order of magnitude, but skipjack predominated even more heavily--Trans.

Note: The listing of the materials and dimensions of the seine net is attached as appendix to reprint (Separate No. 782) of this article. For free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D. C. 20240.

CONCLUSIONS

1. It is possible to catch tunas by purse seine on coast of Angola.

2. Practical results were obtained using "European system"--seining with aid of live bait.

3. The length and height of the net used were adequate to capture tunas at surface and below it.

4. The twine used and the knotless net proved adequate for small and medium schools (to 20 metric tons) of fish up to about 15 kilograms.

5. The mesh used, 7 centimeters stretched, could be a centimeter larger without danger of gilling the smallest fish caught (about 1.5 kilograms). To capture larger schools and/or larger fish, it would be advisable to double diameter of the twine.

6. The design of the net bag was completely satisfactory with regard to strength, even for fish averaging 40 kilograms.

7. We believe an increase in number of corks or use of larger corks would increase buoyancy of net, which appeared insufficient at times.

8. Observations made on fish of same species and size, landed on same day and place with same number of fishing hours and methods of handling aboard, but caught by different methods--seining and live bait--showed that seined fish were "riper." The seined fish could be processed immediately by the factory, while hook-and-line fish had to lay over until the next day. We believe this "hardening" is due to the struggles of seined fish during capture and lifting aboard.

9. It is not yet possible to say whether seining is economically practical because of the experimental nature of this work. A further study covering at least a whole season and carried out on commercial fishing lines is necessary.



INDEX

- | | |
|--|--|
| <p>Page</p> <p>UNITED STATES:</p> <p>Events and Trends:</p> <p>1 .. Interior Will Step Up Fish Protein Concentrate Program</p> <p>4 .. BCF Head Reports Striking Technologic Gains in 1966</p> <p>7 .. Forecast Fewer Groundfish and Scallop on New England Banks</p> <p>Marketing:</p> <p>8 .. Outlook for Edible Fishery Products in 1967 and Review of 1966</p> <p>8 .. December 1966 Wholesale Prices and Indexes for Edibles</p> <p>10 .. 1966 Shrimp Imports Rose 8.7%</p> <p>Salmon:</p> <p>10 .. December 1966 Pacific Canned Stocks Higher than 1965</p> <p>11 .. Defense Bought More Fishery Products in October-November 1966</p> <p>11 .. Can Shipments for Fishery Products Steady</p> <p>11 .. Fish Meal Supply Rose 20%, Solubles Dropped 13%</p> <p>12 .. Over 100 Fishery Cooperatives</p> <p>Oceanography:</p> <p>12 .. Gulf Coast Salt Domes May Have Other Uses</p> <p>12 .. Planned Atlantic Shelf Sediment Data Bank</p> <p>12 .. First Nautical Charts for Savannah River Channel Available</p> <p>States:</p> <p>Alaska:</p> <p>14 .. Fishery Products Are Most Valuable in Its 100th Year</p> <p>Oregon:</p> <p>14 .. Umatilla Indians Seek to Establish Coho Salmon Run</p> <p>North Carolina:</p> <p>Calico Scallop Fishery Thrives</p> <p>Washington:</p> <p>14 .. Puget Sound Hake Fishery Shows Promise</p> <p>Virginia:</p> <p>14 .. Fossil Oysters Found on Continental Shelf</p> <p>Bureau of Commercial Fisheries Programs:</p> <p>15 .. Cruise "Delta I" of the "Geronimo," by Reed S. Armstrong, John R. Grady, and Robert E. Stevenson</p> <p>Central Pacific Fisheries Investigations:</p> <p>19 .. "Cromwell" Studies Relation Between Birds, Surface Schools, Sonar Targets</p> <p>Great Lakes Fisheries Explorations and Gear Development:</p> <p>20 .. "Kaho" Catches Many Alewife, Finds Good Trawling Grounds</p> <p>Alaska Fisheries Explorations and Gear Development:</p> <p>21 .. "Manning" Conducts Shrimp Survey Off Southeast Alaska</p> <p>North Atlantic Fisheries Explorations and Gear Development:</p> <p>22 .. "Delaware" Explores Continental Shelf Slope</p> <p>23 .. What A Tuna Can See</p> <p>24 .. La Jolla First to Raise Mackerel and Sardines to Advanced Juvenile Stage</p> <p>25 .. La Jolla's Tuna Vessel Research Pays Off</p> <p>25 .. King Crab Waste, A Pollutant, Becomes Salable Fish Meal</p> <p>26 .. Holds Sanitation Workshops to Aid Industry</p> | <p>Page</p> <p>UNITED STATES (Contd.):</p> <p>Bureau of Commercial Fisheries Program (Contd.):</p> <p>26 .. Boothbay Lab Studies Lobster Habitat Improvement</p> <p>26 .. Gloucester's Prototype Shrimp Separator Shows Merit</p> <p>26 .. Atlantic Tuna Tagging Shows Definite Trans-Ocean Migration</p> <p>27 .. BCF Ann Arbor Base Explores Idea of Using LASER for Fish Detection</p> <p>27 .. Menhaden Eggs Found Off North Carolina</p> <p>27 .. BCF Offers Reward for Tagged Fluke</p> <p>INTERNATIONAL:</p> <p>29 .. U. S. and Japan Discuss New U. S. 12-Mile Zone</p> <p>Central American Fisheries Development Commission:</p> <p>29 .. Holds First Meeting in San Salvador</p> <p>29 .. FAO Conducts Orientation Cruise for Barbarian Fishermen</p> <p>Law of the Sea Conventions:</p> <p>30 .. Mexico Agrees to All 4 Conventions</p> <p>30 .. Asian Tuna Conference Postponed Until Spring</p> <p>12th International Congress of Refrigeration:</p> <p>30 .. To Meet This Summer</p> <p>30 .. Scandinavian Nations Agree on Access to Skagerrak and Kattegat</p> <p>FOREIGN:</p> <p>Canada:</p> <p>31 .. Boasts New Research Vessel "E. E. Prince"</p> <p>31 .. Expands East Coast Fleet and Processing Facilities</p> <p>32 .. British Columbia Canned Salmon Pack Was Double 1965's</p> <p>Fishing Licenses Put on Fiscal Year Basis</p> <p>Latin America:</p> <p>Brazil:</p> <p>33 .. Explains Adoption of 12-Mile Limit</p> <p>British Honduras:</p> <p>33 .. Lobster Is By Far No. 1 Fishery Export</p> <p>Chile:</p> <p>33 .. Fish Meal and Oil Production Up First 8 Months 1966</p> <p>Venezuela:</p> <p>33 .. Shrimp Industry Falters</p> <p>Mid East:</p> <p>Israel:</p> <p>34 .. Mullet Spawned in Captivity</p> <p>Europe:</p> <p>USSR:</p> <p>35 .. Mothership Whaling Off Japan Disturbs Industry</p> <p>35 .. Fishes Off Mexico</p> <p>35 .. Organizes Bering Sea Fishing Expedition</p> <p>35 .. Kinds and Value of Exports to U. S. Change</p> <p>35 .. New Fishery Products Planned</p> <p>36 .. Discovers New Shrimp Resources</p> <p>36 .. Rail Move Aids King Crab Transplant Program</p> <p>37 .. Holds Conference on Marine Mammals</p> <p>37 .. Meteorologists to Help Fishermen</p> <p>37 .. Conducts Extensive Pacific Fishery Research</p> <p>Norway:</p> <p>38 .. Builds Several Long-Range Fishing Vessels</p> |
|--|--|

Index continued page 68.

INDEX (CONTINUED)

- | | |
|---|---|
| <p>Page</p> <p>FOREIGN (Contd.):</p> <p>Europe (Contd.):</p> <p>Norway (Contd.):</p> <p>38 .. Exports of Most Fishery Products Up in First 9 Months of 1966</p> <p>39 .. Good Market for Fish Meal and Oil in December 1966 Reported</p> <p>39 .. Firm to Make High-Protein Fish Meal</p> <p>40 .. Fish Meal and Oil Supplies Were High in First 10 Months of 1966</p> <p>Iceland:</p> <p>40 .. Exports of Fish Meal and Oil Were Up, Fillets and Stockfish Down</p> <p>Denmark:</p> <p>40 .. Modern Purse-Seine Vessel Acquired</p> <p>Greenland:</p> <p>40 .. Fisheries Processing Plant Is Being Built</p> <p>France:</p> <p>41 .. Plans to Assist Fishing Industry</p> <p>41 .. Tuna Landings Were 10% of Fish Production</p> <p>German Federal Republic:</p> <p>41 .. Imports 80% of Canned Tuna in Oil from Japan</p> <p>Italy:</p> <p>41 .. Frozen Tuna Import Quota Increased 5,000 Tons</p> <p>United Kingdom:</p> <p>41 .. Fishery Loan Interest Rates Announced</p> <p>Greece:</p> <p>42 .. Landings Rose in First 9 Months of 1966</p> <p>Romania:</p> <p>42 .. Fishes Off Africa</p> <p>Bulgaria:</p> <p>42 .. Has Ambitious 5-Year Plan</p> <p>Poland:</p> <p>42 .. Will Produce Fish Protein Concentrate</p> <p>42 .. First Fishery Factory-Mothership Sails for North Atlantic</p> <p>Czechoslovakia:</p> <p>43 .. To Import British Frozen Fish</p> <p>Ireland:</p> <p>43 .. Extends Fisheries Zone to 12 Miles</p> <p>43 .. BCF Experts to Aid Irish Fisheries</p> <p>Asia:</p> <p>Japan:</p> <p>44 .. Curbs Port Calls by Foreign Vessels</p> <p>44 .. Has \$6.4 Million Overseas Fishery Investments</p> <p>44 .. Grants \$9 Million to S. Korea for Fisheries Development</p> <p>45 .. Profits Rise for Medium and Small Fishery Firms</p> <p>45 .. Albacore Price Stabilization Is Successful</p> <p>45 .. Unified Tuna Fishery Administration Under Study</p> <p>46 .. Approves Atlantic Tuna Transshipments to Spain</p> <p>46 .. Tuna Mothership Fishery to Try Plastic Portable Boats</p> | <p>Page</p> <p>FOREIGN (Contd.):</p> <p>Asia (Contd.):</p> <p>Japan (Contd.):</p> <p>46 .. Trawler to Explore Off U. S. East Coast</p> <p>46 .. Consultant Service Evokes Wide Interest Abroad</p> <p>46 .. Start Made on Large Government Research Vessel</p> <p>47 .. Hake Is Gaining Consumer Acceptance</p> <p>47 .. Trawler Explores Fisheries Off U. S. Pacific Coast</p> <p>47 .. Atlantic Tuna Long-Liners Report Good Fishing</p> <p>47 .. Purse Seiner Continues Trial Tuna Fishing in South Pacific</p> <p>47 .. Purse Seining Is Good Off New Guinea</p> <p>47 .. Ends Tuna Mothership Operations in South Pacific</p> <p>48 .. Coastal Whale Kill Was 2,348</p> <p>48 .. Licenses Only One Firm for 1967 Arctic Salmon Operation</p> <p>48 .. Swordfish Exports to U. S. and Canada Are Steady</p> <p>48 .. Frozen Tuna Export Validations Were Steady in 1966 Period</p> <p>49 .. Albacore Export Price Declines</p> <p>49 .. 70 Tuna Long-Liners in Atlantic</p> <p>49 .. Canned Tuna Sales in First 10 Months 1966 Above 1965</p> <p>49 .. Tuna Prices Higher in Leading Port</p> <p>50 .. 1966 Pole-and-Line Skipjack Tuna Landings Were Approaching New High</p> <p>50 .. Skipjack Tuna Fishery Is Regaining Strength</p> <p>50 .. Increases Yellowfin Direct-Export Quota for U. S.</p> <p>50 .. Fishery Catch Sets New High in 1965</p> <p>South Korea:</p> <p>51 .. Explores Fishing Grounds in South China Sea</p> <p>51 .. Unable to Enter High-Seas Mothership Salmon Fishery</p> <p>Taiwan:</p> <p>51 .. Seeks Larger World Bank Loan to Build Vessels</p> <p>Africa:</p> <p>Ghana:</p> <p>52 .. State Has 26 Trawlers</p> <p>South-West Africa:</p> <p>52 .. Fish Meal Plants Complete 1966 Pilchard Quotas</p> <p>52 .. Foreign Fishing Off U. S. Coasts, December 1966</p> <p>ARTICLES:</p> <p>55 .. The Surf Clam Fishery, by Thomas M. Groutage and Allan M. Barker</p> <p>59 .. Technology's Role in the Seafood Industry, by Harold B. Allen</p> <p>62 .. Experimental Purse Seining for Tunas in Portuguese West Africa, by Fernando Correia da Costa and David Braganca Gil</p> |
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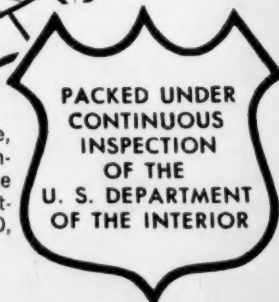
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6